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# BASAL METABOLISM STANDARDS FOR CHILDREN

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The widespread use of the test for basal metabolism which has developed since 1910, when F. G. Benedict introduced his new apparatus, has opened up problems which were not anticipated while investigation was confined to physiologic laboratories. When this test became an adjunct of clinical practice, entirely new fields of research were opened. The test was performed not only on normal persons but on patients, and many conditions were found to influence metabolism.

The body surface standards that were used for adult patients gave surprisingly accurate information but were not satisfactory for children. This was appreciated early by many pediatricians, who could not correlate their findings with those of clinical experience; but the worker with adults did not admit that the hard and fast rules applied to mature persons could not be used for children. The difference in point of view can be explained best by the main physiologic difference in the two age groups: Children are in the process of continual change, while persons of middle life are stabilized; the degenerative changes of old age occur only in a relatively small group.

The question arose early in my mind as to which standard of metabolism gave the truest picture of what was taking place in the body, since it was found that there were groups of children for whom the various standards gave inconsistent results. It was not an uncommon experience to find that use of the body surface standard permitted one interpretation and that of the total calory standard another. How was one to decide whether a metabolism of minus 20 per cent according to one standard represented clinical facts, when use of another standard gave plus 2 per cent? DuBois has drawn attention to this in the third edition of his excellent book.[1]

Fifteen years ago I commenced to study this problem by comparing the metabolism in all my cases with all the standards available to me,

1. Dubois, Eugene F.: Basal Metabolism in Health and Disease, Philadelphia, Lea & Febiger, 1936.

watching the clinical progress to see which standard gave the figures most compatible with experience. It was found clinically that so long as the physical development of a child was within so-called normal limits, there was little or no choice among the various standards. This was confirmed by a statistical study of a large number of girls published in 1937.[2] Children with abnormal developments, such as obesity and undernutrition, were quite another matter, and widely divergent results were frequently obtained. Clinical tests were applied to such children, in some instances being carried on for months, and in some children the therapeutic action of thyroid extract was observed. It became clear that what seemed to be a subnormal metabolism associated with obesity and an elevated metabolism noted with undernutrition were not consistent with the clinical progress in the cases. As a result of these studies, it was concluded that fewer mistakes resulted when the standard of total calories for the weight supplemented by that of total calories of the height (in other words, the total calories for the "expected weight") was used for children. The arguments for this point of view have been presented elsewhere, and detailed discussions of undernutrition and obesity will appear in subsequent papers.

A clear understanding of the point of view expressed here cannot be had unless it is admitted that the body is composed of two main types of tissue, only one of which produces heat; that the surface of the body does not regulate the amount of heat produced, and, finally, that any relation between the surface area of the body and heat production is mathematical and not physiologic. It necessarily follows that any change in the ratio of active to inactive tissue will affect results which are compared with standards depending on body weight and will give figures which represent the relative heat production rather than the actual amount of heat produced. Although marked and rapid changes in body weight are not uncommon, the height changes little. Because of this it can be used in standards for children of abnormal weight to show the true effect of variations in weight on metabolism. Since the figures of heat production given in the height standard were obtained from children whose weight was normal for their height, the standard can be called the height standard or the standard for the "expected weight."

The standards presented here have been developed to conform so far as possible with the conditions met in clinical research in Boston. They include figures for heights and weights which have previously not been given. They have been tested on both hospital and office patients. The standards for girls were made up from data on 2,200

2. Talbot, F. B.; Wilson, E. B., and Worcester, J.: Basal Metabolism of Girls: Physiologic Background and Application of Standards, Am. J. Dis. Child. **53**:273 (Jan., pt. 2) 1937.

persons, some material having come from my own cases and the rest from cases reported in the literature. These standards were developed by statistical methods. The standards for boys were made up from smoothed curves plotted from data for a total of 800 persons. It is hoped that when a sufficient number of additional cases accumulate they also may be studied statistically.

The interpretation of the metabolism of children requires special knowledge. Metabolism cannot be said to have a plus or minus variation without consideration of several factors. It has been shown that because of geographic factors there are differences in children's heat production, which are small in cities of approximately the same latitude, for example San Francisco and Boston. There are age differences in heat production in these two cities, since the younger children in the former produce more heat than those in the latter but the difference disappears with increasing age. It is therefore important that each clinic should select a standard and determine the corrections which should be made to adjust it to local conditions.[3]

The metabolism of normal trained adults may vary 3.2 per cent from day to day, while that of the child probably varies up to 5 per cent. Normal variations from the standards given here may extend from minus 15 per cent to plus 15 per cent.

The evidence available in the literature [2] suggests the conclusion that puberty is not the cause of the rise in metabolism seen at that time. There is good evidence that this rise is due to the associated increased speed of growth. Elevated metabolism is seen at other ages when there is unusually rapid growth. This should be considered in interpreting results. Metabolism is influenced to some extent by menstruation, with a premenstrual rise and a fall of 5 per cent. There is a relation between the pulse rate and metabolism. This is seen clearly in exercise. Fever and food also increase the rate of metabolism.

### OBESITY

When obese children are tested, an estimate should be made of the amount of their muscle, or heat-producing tissue, and its relation to the amounts of fat and water, which are inert. Suppose a child suddenly gained 30 or 40 pounds (13 to 18 Kg.) in fat or water, as in edema. His weight would be greater, but his heat production should

3. Talbot, F. B.; Wilson, E. B., and Worcester, J.: Standards of Basal Metabolism of Girls (New Data) and Their Use in Clinical Practice, J. Pediat. 7:655, 1935. The children studied by Lewis, Kinsman and Iliff in Denver have a metabolism 11 per cent higher, both for weight and height, than the standards recorded here up to 35 Kg. and 150 cm., after which they approximate our figures. The two groups are comparable since the children over 5 years of age were all awake. It is unfortunate that these authors did not understand this fact.

TABLE 1.—*Standard Total Calories for Weight—Girls and Boys*

| Weight, Kg. | Total Calories per 24 Hours | | Weight, Kg. | Total Calories per 24 Hours | |
|---|---|---|---|---|---|
| | Girls* | Boys | | Girls* | Boys |
| 3.0 | 136 | 150 | 36.0 | 1,173 | 1,270 |
| 4.0 | 205 | 210 | 38.0 | 1,207 | 1,305 |
| 5.0 | 274 | 270 | 40.0 | 1,241 | 1,340 |
| 6.0 | 336 | 330 | 42.0 | 1,274 | 1,370 |
| 7.0 | 395 | 390 | 44.0 | 1,306 | 1,400 |
| 8.0 | 448 | 445 | 46.0 | 1,338 | 1,430 |
| 9.0 | 496 | 495 | 48.0 | 1,369 | 1,460 |
| 10.0 | 541 | 545 | 50.0 | 1,399 | 1,485 |
| 11.0 | 582 | 590 | 52.0 | 1,429 | 1,505 |
| 12.0 | 620 | 625 | 54.0 | 1,458 | 1,555 |
| 13.0 | 655 | 665 | 56.0 | 1,487 | 1,580 |
| 14.0 | 687 | 700 | 58.0 | 1,516 | 1,600 |
| 15.0 | 718 | 725 | 60.0 | 1,544 | 1,630 |
| 16.0 | 747 | 750 | 62.0 | 1,572 | 1,660 |
| 17.0 | 775 | 780 | 64.0 | 1,599 | 1,690 |
| 18.0 | 802 | 810 | 66.0 | 1,626 | 1,725 |
| 19.0 | 827 | 840 | 68.0 | 1,653 | 1,765 |
| 20.0 | 852 | 870 | 70.0 | 1,679 | 1,785 |
| 22.0 | 898 | 910 | 72.0 | 1,705 | 1,815 |
| 24.0 | 942 | 980 | 74.0 | 1,731 | 1,845 |
| 26.0 | 984 | 1,070 | 76.0 | 1,756 | 1,870 |
| 28.0 | 1,025 | 1,100 | 78.0 | 1,781 | 1,900 |
| 30.0 | 1,063 | 1,140 | 80.0 | 1,805 | ..... |
| 32.0 | 1,101 | 1,190 | 82.0 | 1,830 | ..... |
| 34.0 | 1,137 | 1,230 | 84.0 | 1,855 | 2,000 |

* From Talbot, Wilson and Worcester.[3]

TABLE 2.—*Standard Total Calories for Height (or Total Calories for the Expected Weight)*—Girls and Boys*

| Height, Cm. | Total Calories per 24 Hours | | Height, Cm. | Total Calories per 24 Hours | |
|---|---|---|---|---|---|
| | Girls† | Boys | | Girls† | Boys |
| 48 | 134 | ... | 92 | 681 | 725 |
| 50 | 159 | ... | 94 | 695 | 740 |
| 51 | ... | 160 | 96 | 709 | 755 |
| 52 | 186 | 175 | 98 | 722 | 765 |
| 54 | 214 | 200 | 100 | 735 | 785 |
| 56 | 246 | 225 | 105 | 770 | 805 |
| 58 | 278 | 260 | 110 | 807 | 830 |
| 60 | 309 | 300 | 115 | 846 | 875 |
| 62 | 341 | 315 | 120 | 894 | 935 |
| 64 | 373 | 360 | 125 | 942 | 990 |
| 66 | 404 | 390 | 130 | 987 | 1,045 |
| 68 | 433 | 420 | 135 | 1,057 | 1,105 |
| 70 | 462 | 450 | 140 | 1,130 | 1,165 |
| 72 | 489 | 480 | 145 | 1,208 | 1,220 |
| 74 | 515 | 510 | 150 | 1,294 | 1,290 |
| 76 | 539 | 535 | 155 | 1,386 | 1,380 |
| 78 | 560 | 565 | 160 | 1,477 | 1,480 |
| 80 | 581 | 590 | 165 | 1,544 | 1,570 |
| 82 | 601 | 612 | 170 | 1,584 | 1,655 |
| 84 | 619 | 635 | 175 | 1,596 | 1,720 |
| 86 | 636 | 660 | 180 | 1,600 | 1,800 |
| 88 | 652 | 685 | 190 | ..... | 1,900 |
| 90 | 666 | 705 | | | |

* Since the height standard is based on a normal weight, this can also be called expected weight.

† From Talbot, Wilson and Worcester.[3]

remain the same if the amount of muscle remains the same. The total calories for the weight would then be reduced and those for the height would remain normal. Suppose a load of 30 or 40 pounds were strapped to the body of a child of the same height and age; if this child exercised a normal amount for a month or two, he should then develop enough muscle to carry the extra load. His heat production and weight should increase as a result. He might then have a normal metabolism for his weight and an elevated metabolism for his height. Therefore, it is necessary to consider the body make-up in interpreting the results obtained for obese persons.

## MALNUTRITION

If underweight children are considered in the same manner, it is found that the total calories for the weight seem to be elevated and that the calories for the height or for the "expected weight" for the height are within normal limits until a weight about 20 per cent below normal is reached. Beyond that point there is a definite average lowering of the total amount of heat actually produced. This will be discussed in a subsequent paper.

## SUMMARY

Standards of metabolism for girls and boys are presented. They have been tested clinically on both normal and abnormal children. They have given results which are more consistent with clinical findings and experience than other standards that were tested.

# RETARDATION OF GROWTH IN DIABETIC CHILDREN

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Observations in the clinic of the Department of Pediatrics, College of Medicine, University of Iowa, have indicated that the majority of children with diabetes mellitus have a normal propensity for growth. Our earlier data [1] have been amplified by measurements which were collected during the past ten years. These measurements confirm the earlier conclusions that the well controlled diabetic child may be expected to grow at a rate which equals or exceeds that of superior children. However, in a review of data for 167 children with diabetes mellitus observed in this clinic prior to January, 1935, physical retardation was noted in 6 per cent of the group. This report deals with the 10 children whose stature or rate of growth over long periods was markedly lower than the standard values used for comparison. The norms chosen as standards were those compiled by the Iowa Child Welfare Research Station; they are typical of the population from which these children were drawn and are somewhat higher than the average standards commonly employed.[2] Lesser degrees of retardation were noted as transitory or persistent characteristics in the development of some other subjects, but these children were not included in this study because of the difficulty in determining whether or not they presented a true anomaly in rate of growth.

This group of 10 children includes 4 boys and 6 girls, 2 of the latter being twins. In half of the group diabetes mellitus had been recognized by the third year of life; the average age of onset was 4.9 years. The duration of the disease at the time these studies were begun ranged from four to thirteen years, with an average of nine and one half years. These patients had been under intermittent or recurrent observation in the clinic for periods ranging from one and one half to eleven years, the average being five and one half years. Four of the children were seen in the clinic within a year after the diagnosis of diabetes had been established. Supervision of 2 of these children was maintained more or less continuously, if not effectively, whereas the other 2 discontinued the prescribed regimen and did not return until seven years of mismanagement had intervened. The other 6 children

From the Department of Pediatrics, College of Medicine, University of Iowa.

1. Boyd, J. D., and Nelson, M. V.: Growth Studies of Children with Diabetes Mellitus, Am. J. Dis. Child. **35**:753 (May) 1928.

2. Meredith, H. V.: The Rhythm of Physical Growth, Studies in Child Welfare, Iowa City, University of Iowa, 1935, vol. 11, no. 3. Boynton, B.: The Physical Growth of Girls, ibid., 1935, vol. 12, no. 4.

had been under diabetic management elsewhere for periods of from two to ten years before they came under our observation.

While under the guidance of this clinic, each of these 10 children ostensibly was under the regimen employed for the remainder of the children with diabetes mellitus. The diet supplied a rich allowance of vitamins and minerals, a protein allowance of a gram per pound for the child of normal size and definitely more than that amount for those who were extremely young or who were retarded in growth and a caloric allowance designed for full activity, with the calories distributed among carbohydrate, protein and fat in accordance with a conventional pattern. Until 1932 the fatty acid-dextrose ratio of the prescribed diet was uniformly 1½:1; after that time it was 1:1½. Insulin was used uniformly, in amounts designed to keep the concentration of blood sugar within normal limits at all

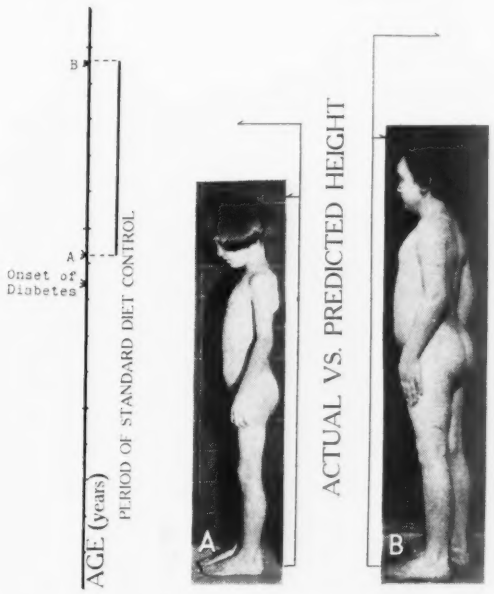


Fig. 1.—M. B. was born on Aug. 22, 1922. She was always smaller than other children. Diabetes was diagnosed at the age of 8½ years. Diabetic control was inconstant, owing to her instability; she was unable to ingest regularly the quantity of food calculated for her needs. On two different occasions she received a pituitary extract containing the growth-promoting hormone for periods of months without apparent effect on her growth. A roentgenogram of the sella (fig. 11) suggests that the hypophysis is small. Deceleration of growth becomes more marked with the passage of time. *A* was taken at the age of 9 years and 2 months, when her height was 44½ inches (113 cm.) and her weight 45 pounds (20.5 Kg.). *B* was taken at the age of 14 years and 6 months, when her height was 50¾ inches (129 cm.) and her weight 71½ pounds (32.5 Kg.).

times, so far as possible. Usually each patient was seen about once every four months, at which time the determinations of blood sugar were made before breakfast and at two intervals during the same forenoon; studies were made of the urine, and the child was weighed, measured and examined physically, his progress during the interval and his complaints being recorded. Certain other routine

examinations were made to insure a proper appraisal of the child's physical, social and medical progress. On the basis of the findings, revisions of diet, of insulin dosage or of other factors in the regimen were made to meet the child's current needs.

Two children stood apart from the remainder of the group. These children were small of stature when the disease first was diagnosed (figs. 1 and 2). It is possible that diabetes had been present in a mild form for some time prior to its detection and that the small stature was dependent on the resultant wastage of food. This seems unlikely, as the

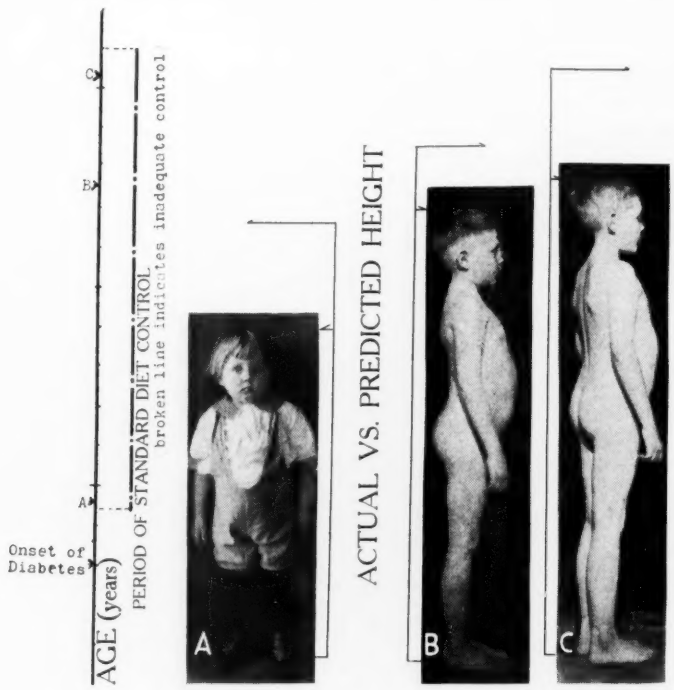


Fig. 2.—L. M. was born on May 3, 1921. He was always small. Diabetes was diagnosed at the age of 3 years. Owing to the child's instability of control and poor economic circumstances, management was always unsatisfactory. Several instances of severe acidosis have occurred. Hepatomegaly has persisted. Deceleration of growth becomes more marked with the passage of time. *A* was taken at the age of 4 years and 7 months, when the height was 37½ inches (95 cm.) and the weight 35 pounds (15.9 Kg.). *B* was taken at the age of 12 years and 6 months, when the height was 49½ inches (126 cm.) and the weight 62½ pounds (28.4 Kg.). *C* was taken at the age of 15 years and 4 months, when the height was 51½ inches (131 cm.) and the weight 70 pounds (31.8 Kg.).

child shown in figure 1 had been considered small from birth and her diabetes had not become manifest until she was 9 years old. These children presented another characteristic of growth not seen in other members of the group: Their degree of retardation of growth became

progressively greater with the passage of time, whereas the remaining 8 children showed a capacity for accelerated growth. Early records of growth were not available for these other children; 3 were of approximately normal size two or three years after the onset of the disease, whereas the remainder were definitely undersize at the time of our first observation.

Eight of the children showed satisfactory rates of growth while under observation and diabetic control; the gains surpassed the predicted average increment in growth for varying periods. Four of the group showed

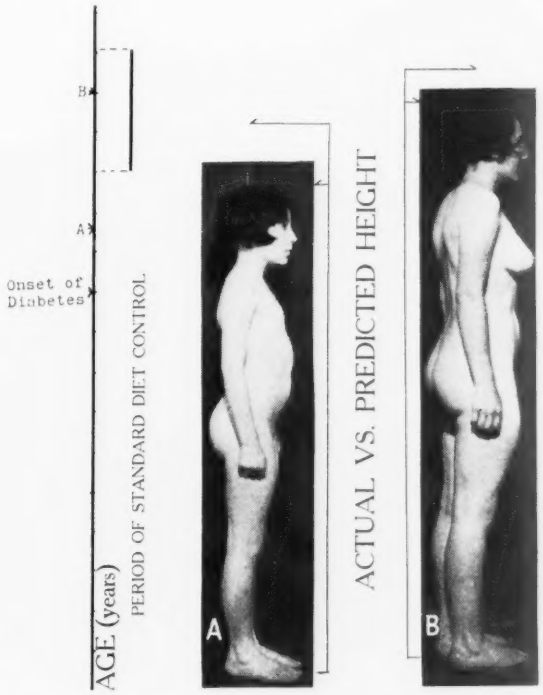


Fig. 3.—B. S. was born on May 16, 1921. Diabetes was diagnosed at the age of 10 years. Control of the glycosuria was good throughout the period of observation, but the mother insisted on therapeutic undernutrition until the age of 13 years, when progressive retardation of growth led to acceptance of a full caloric regimen. The girl apparently has a good capacity for growth and is approaching normal size. Normal menstruation was established. *A* was taken at the age of 11 years and 7 months, when the height was 51½ inches (131 cm.) and the weight 69 pounds (31.4 Kg.). *B* was taken at the age of 15 years and 1 month, when the height was 59½ inches (151 cm.) and the weight 112 pounds (50.9 Kg.).

an acceleration of growth sufficient to bring them within the normal range of height. The favorable progress of 2 others was checked when the control of the diabetes and of the diet was allowed to lapse for long periods.

Resumption of growth cannot be attributed to the preadolescent spurt, except possibly in the case of B. S. (fig. 3) and H. S. (fig. 4); in the others, capacity for normal growth or noteworthy acceleration occurred before the period for preadolescent changes in growth. Puberty and menstruation were established in the 3 oldest girls. Pubescence, while definitely retarded, was making its appearance in the 3 oldest boys.

None of these 10 children had a severe form of diabetes. Difficulty in maintaining stable control was experienced in most cases, and the resultant recurrent glycosuria may have been a factor of importance in

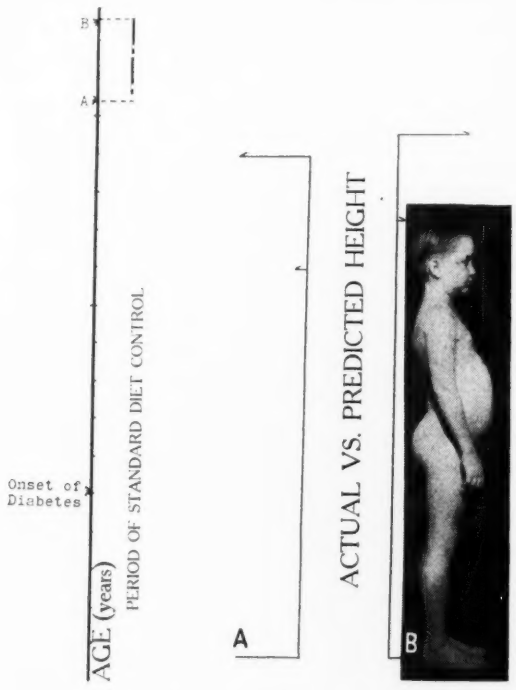


Fig. 4.—H. S. was born in 1918. Diabetes was diagnosed at the age of 5 years. Therapeutic undernutrition was constant for ten years; the subsequent diet was not up to the calculated needs, but its use was associated with acceleration of the rate of growth. Thyroid was employed at one time as an accelerator of growth, without evident effect. *A* pertains to the age of 15 years and 4 months, when the height was 50¼ inches (128 cm.) and the weight 66 pounds (30 Kg.). *B* was taken at the age of 17 years and 4 months, when the height was 56¾ inches (144 cm.) and the weight 89 pounds (40.5 Kg.).

the retardation of growth. Moreover, this instability made home management difficult and may have led to poorer cooperation than otherwise would be expected. The unwillingness or inability of the patients and parents to cooperate was a definite factor in some instances; studies have shown that suitable diabetic control could be maintained in the

hospital with comparative ease, whereas in the home the patient was frequently or persistently out of control. Economic factors played a role but probably were not a sole determinant in any instance. Some of these children were kept under suitable diabetic management with the greatest difficulty even in the hospital, showing great instability. Possibly this represented an intrinsic peculiarity, but in view of the fact that after prolonged careful control the instability was diminished, it is equally possible that such inconstancy of response should be attributed to lack of continued consistent diabetic management at home. These

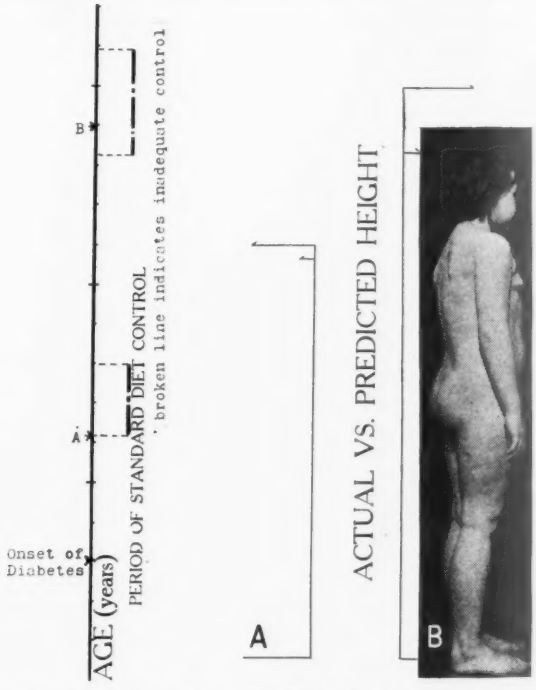


Fig. 5.—D. F. was born on May 27, 1921. Diabetes was diagnosed at the age of 3 years. A suitable dietary regimen and control were established at the age of 6 years, but were not continued. Deceleration of growth progressed until the age of 13 years, when a standard regimen was reestablished. During the next eight months she gained 2¼ inches (5.7 cm.) and the menses became established. The hepatomegaly diminished. *A* pertains to the age of 6 years and 2 months, when the height was 44½ inches (113 cm.) and the weight 36¼ pounds (16.5 Kg.). *B* was taken at the age of 14 years, when the height was 55½ inches (141 cm.) and the weight 100 pounds (45.5 Kg.).

children showed wide oscillations of the blood sugar level, often passing abruptly from hyperglycemia into severe shock. They exhibited fasting hyperglycemia comparable to that observed in the remainder of the diabetic children.

Available records indicated that glycosuria was more or less continuous and often of marked degree during the period of retarded growth. Dietary control was inconstant. Some children were not kept under dietary management and probably received a diet similar to that commonly used in families of a similar economic level. Several children had followed prescribed diets which had become markedly insufficient for their needs, owing to the nonrecognition of the necessity for periodic upward revision of diets during the period of growth.

Retardation of growth was accompanied in several instances by additional evidences of abnormality. Most of the children exhibited hepatomegaly of varied degree which tended to subside after a few

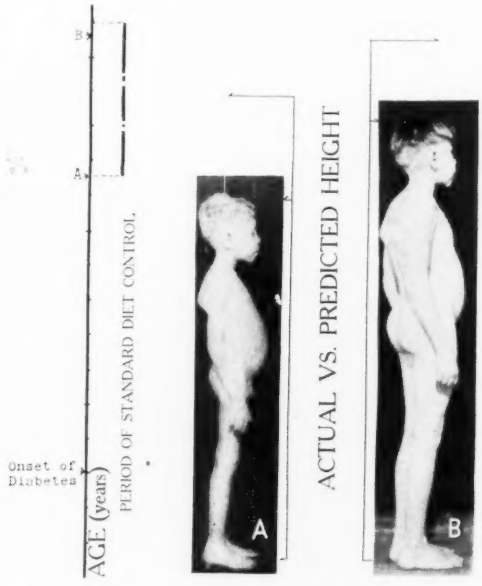


Fig. 6.—J. F. was born on June 21, 1921. Diabetes was diagnosed at the age of 3 years. The child was on a low caloric regimen for over eight years; the adequacy of control of the glycosuria is not known. He has not received a full calculated diet since that time. Growth has been resumed, but stunting still is marked. *A* was taken at the age of 11 years and 6 months, when the height was 44½ inches (13 cm.) and the weight 42 pounds (19.1 Kg.). *B* was taken at the age of 15 years and 7 months, when the height was 54 inches (137 cm.) and the weight 75 pounds (34.1 Kg.).

months of suitable management. Severe diabetic acidosis was described in the records of 4 children. Severe insulin shock had been experienced by several members of the group. One child when first seen had a history of recurrent attacks of convulsions which had led to a diagnosis of epilepsy; phenobarbital had been used for three years. These convulsions were always associated with hypoglycemia and responded to the

administration of dextrose. Another child, who returned to the hospital after seven years of mismanagement of her diabetes in the home, complained of severe headaches and abdominal pain (fig. 5). Physical examination revealed enlargement of the liver and bilateral papilledema. With the establishment and maintenance of diabetic control the symptoms subsided.

In general, complications and sequelae were not of greater frequency or of different nature in this group of children than among poorly controlled diabetic children of normal stature. None of the children with retarded growth had positive Wassermann or tuberculin tests.

The importance of uncontrolled diabetes as a cause of retardation of growth becomes evident when one notes the response of most of these children to an adequate type of management, including nutritionally

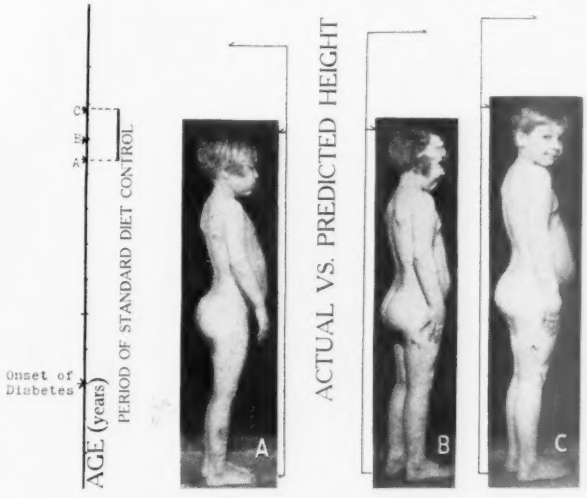


Fig. 7.—Ma. C., a twin, was born on June 18, 1926. Diabetes was diagnosed at the age of 3½ years. For six years control was irregular and there were severe hypoglycemic reactions simulating epilepsy. With establishment of a standard regimen, a growth of 5¾ inches (14.6 cm.) occurred in seventeen months. *A* was taken at the age of 9 years and 5 months, when the height was 42½ inches (108 cm.) and the weight 45 pounds (20.5 Kg.). *B* was taken at the age of 10 years, when the height was 45 inches (114 cm.) and the weight 54 pounds (24.5 Kg.). *C* was taken at the age of 10 years and 10 months, when the height was 48¾ inches (123 cm.) and the weight 67½ pounds (30.7 Kg.).

complete diets and control of glycosuria. This favorable response in growth also indicates that even though diabetes may retard growth, it is not a sufficient excuse for small stature if the disease is properly controlled.

The determining factor in at least 5 of these cases was an insufficient intake of food (figs. 3, 4, 6, 7 and 8). This probably played a large

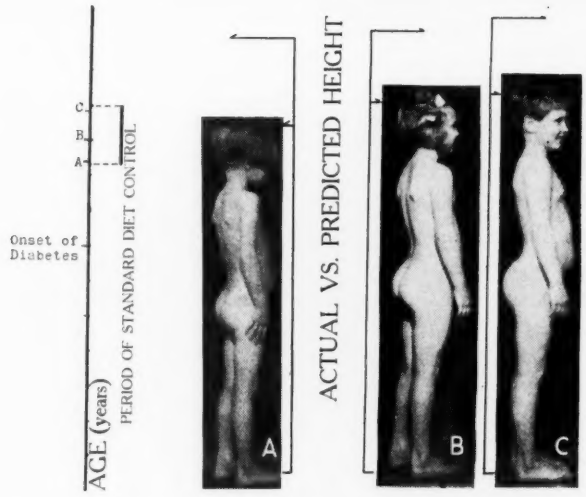


Fig. 8.—Mj. C., a twin, was born on June 18, 1926. Diabetes was diagnosed at the age of 7 years. Control was irregular for three years. With establishment of a standard regimen, a growth of 4¼ inches (10.8 cm.) was noted in the following seven months and a total of 6 inches (15.2 cm.) during the seventeen months of observation. *A* was taken at the age of 9 years and 5 months, when the height was 43¼ inches (110 cm.) and the weight 41 pounds (18.6 Kg.). *B* was taken at the age of 10 years, when the height was 47½ inches (121 cm.) and the weight 54 pounds (24.5 Kg.). *C* was taken at the age of 10 years and 10 months, when the height was 47 inches (119 cm.) and the weight 64¼ pounds (29.2 Kg.). *C*

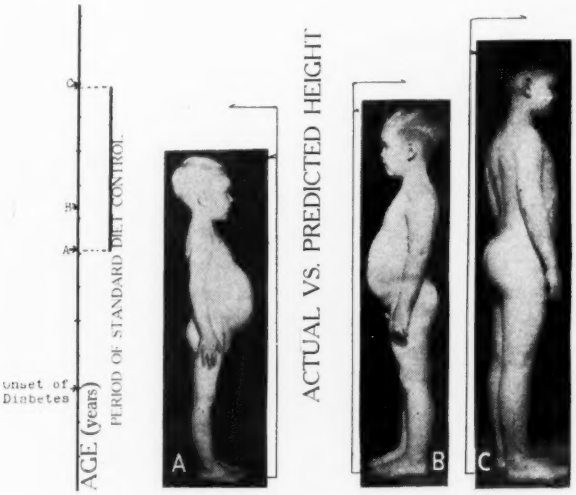


Fig. 9.—H. B. was born on June 24, 1925. The onset of diabetes was recognized at the age of 3 years. Parental cooperation and control at home have been good throughout the period of observation. Deceleration of growth has been checked and the child is approaching normal proportions. *A* was taken at the age of 7 years and 1 month, when the height was 42½ inches (108 cm.) and the weight 43½ pounds (19.8 Kg.). *B* was taken at the age of 8 years and 4 months, when the height was 47 inches (119 cm.) and the weight 64¼ pounds (29.2 Kg.). *C* was taken at the age of 11 years and 11 months, when the height was 54¼ inches (138 cm.) and the weight 89 pounds (40.5 Kg.).

part in three other cases (figs. 1, 2, 9). M. B. was never able for any long period to consume the quantity of food calculated to be necessary for her needs; economic conditions limited the allowance offered L. M.; the retardation noted in H. B. probably is a reflection of therapeutic undernutrition, since with adequate food he showed good capacity for growth. It was impossible to determine whether the arrest of growth noted in D. F. and in L. G. (figs. 5 and 10) was dependent on therapeutic limitation of the intake of food during the long period of absence from the clinic or on the associated prolonged glycosuria.

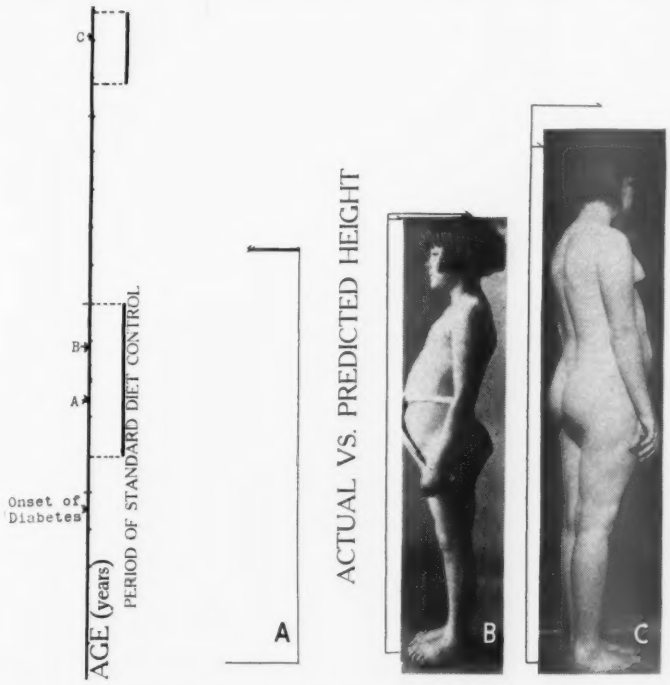


Fig. 10.—L. G. was born on June 22, 1919. Diabetes was diagnosed at the age of 4½ years. Fairly adequate control was maintained until the age of 10 years, at which time a freely chosen regimen with empirical insulin dosage was instituted by the parents. Retardation of growth occurred during that period. Suitable control was reinstituted at the age of 16 years; during the next nineteen months she gained 3¾ inches (9.5 cm.) in height and the menses became established. The hepatomegaly diminished during this period. *A* pertains to the age of 7 years and 4 months, when the height was 47¼ inches (120 cm.) and the weight 54 pounds (24.5 Kg.). *B* was taken at the age of 8 years and 8 months, when the height was 49½ inches (125 cm.) and the weight 68 pounds (30.9 Kg.). *C* was taken at the age of 17 years and 1 month, when the height was 59 inches (150 cm.) and the weight was 114 pounds (51.8 Kg.).

Physical retardation in diabetic children has been attributed by some clinicians to multiple endocrine disturbance or specifically to inadequacy of the growth-promoting function of the anterior lobe of the pituitary

gland. Such endocrine disturbance seems unlikely in those children who have shown a capacity for normal or for accelerated growth under suitable dietary and diabetic management. The 2 who failed to show this capacity may have had pituitary or other deficiency. M. B. (fig. 1), who was small from birth, showed evidence of smallness of the sella turcica in the roentgenograms of her skull (fig. 11). Because of this and because of her failure to grow normally under painstaking diabetic control she received hypodermic injections of a pituitary extract containing the growth-promoting hormone during two different periods, the

Fig. 11.—Roentgenogram of skull of M. B. (see fig. 1), showing the small sella turcica.

most recent one of six months' duration. No effect was noted, either in stimulation of growth or in alteration of the characteristics of her diabetes. Another subject, H. S. (fig. 4), had received a grain (0.06 Gm.) of thyroid daily for six months before he had first been observed in this clinic, without observable effect on his growth.

## CONCLUSIONS

If diabetes mellitus in children is suitably controlled through adequate diet and through avoidance of frequent or continuous glycosuria,

retardation of growth will be prevented or corrected. Physical retardation should be considered a result of nutritional or allied metabolic inadequacies rather than a consequence of endocrine disturbances unless prolonged observance of an ample dietary regimen has failed to maintain a normal rate of growth.

# BACTERIOLOGY OF BLOOD IN RHEUMATIC FEVER

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The conception of rheumatic fever as an infectious disease has led many investigators to attempt to isolate the causative organism from the blood. The results of these studies have been contradictory, and at present there is no unanimity of opinion regarding the existence of a characteristic organism or the frequency with which any organism can be isolated.

Achalme [1] in 1891 isolated a large spore-bearing anaerobic bacillus from the blood at autopsy in cases of rheumatic fever. This was later thought to be the Welch bacillus. The etiologic importance of this finding is nullified by the failure of other workers to confirm it, and also by the fact that such anaerobes are not uncommonly found at necropsy in a variety of diseases.

Blaxall [2] (1896) found minute gram-negative bacilli with marked polar staining in the blood and synovial fluid of arthritic patients. They apparently had chronic rheumatoid arthritis and not rheumatic fever.

Triboulet and Coyon [3] (1897-1898), while trying to isolate Achalme's bacillus, grew a gram-positive diplococcus from the blood. This organism was a facultative anaerobe. They twice found it with

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1. Achalme, P.: Examen bactériologique d'un cas de rheumatisme articulaire aigu, Compt. rend. Soc. de biol. **43**:651, 1891.

2. Blaxall, F. H.; Bannatyne, G. A., and Wohlman, A. S.: Rheumatoid Arthritis: Clinical History, Etiology, Pathology and Bacteriology, Lancet **1**:1120, 1896; abstr., Crowe, H. W.: Bacteriology and Surgery of Chronic Arthritis and Rheumatism, London, Oxford University Press, 1927, p. 11.

3. Triboulet, H., and Coyon: Recherches bactériologiques concernant un cas de rheumatisme fébrile mortel, compliqué d'endopéricardite et de chorée, Compt. rend. Soc. de biol. **4**:1000, 1897; Bactériologie du rheumatisme articulaire aigu, ibid. **5**:124, 1898; cited by Thomson and Thomson,[10] p. 4.

the bacillus in cases of severe involvement and concluded that it was the causative agent while Achalme's organism was responsible for complications of the disease.

Poynton and Paine [4] (1900), after an extensive series of observations, described a gram-positive diplococcus obtained from the blood and serous exudates of patients with rheumatism. This was an organism which on certain mediums assumed bacillary forms. When injected into animals it caused rheumatoid lesions. These findings were confirmed by Beaton and Walker [5] and by Coombs.[6] Beattie [7] found the organism rarely in the blood and synovial fluid but frequently in the synovial membranes. Identification of this organism is not entirely conclusive, and it is possible that their "Micrococcus rheumaticus" was in reality several strains of streptococci (Andrewes and Horder,[8] Crowe,[9] Thomson and Thomson [10]).

Loeb [11] in 1908 isolated streptococci in 9 of 45 cases of rheumatism, chorea and malignant endocarditis. He also reported finding staphylococci in 2 cases and unidentified bacilli in 2. He stated that he did not believe his streptococcus to be the same as the coccus of Poynton and Paine,[4] chiefly because it was not pathogenic for rabbits. Loeb did not feel that any of the organisms he found were of etiologic importance.

Rosenthal [12] (1909) stated the opinion that M. rheumaticus was probably an enterococcus. He claimed that when cultured anaerobically it became a bacillus and that it was an aerobic form of Achalme's bacillus.

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4. Poynton, F. J., and Paine, A.: The Etiology of Rheumatic Fever, Lancet **2**:861 (Sept. 22) 1900.

5. Beaton, R. M., and Walker, E. W. A.: Etiology of Acute Rheumatism and Allied Conditions, Brit. M. J. **1**:237, 1903.

6. Coombs, C.: Rheumatic Heart Disease, Baltimore, William Wood & Company, 1924.

7. Beattie, J. M.: A Contribution to the Bacteriology of Rheumatic Fever, Brit. M. J. **2**:1781 (Dec. 22) 1906.

8. Andrewes, F. W., and Horder, T. A.: A Study of the Streptococci Pathogenic for Man, Lancet **2**:708 (Sept. 15) 1906.

9. Crowe, H. W.: A New Method for the Differentiation of Certain of the Streptococci, Proc. Roy. Soc. Med. **6**:117, 1913.

10. Thomson, D., and Thomson, R.: An Historical Survey of Researches on the Role of the Streptococci in Acute Articular Rheumatism, Ann. Pickett-Thomson Research Lab. **4**:1, 1928.

11. Loeb, L.: Bacteriology of Acute Rheumatism, Arch. Int. Med. **2**:266 (Oct.) 1908.

12. Rosenthal, G.: Serum Treatment of Rheumatism, abstr., Lancet **2**:502 (Aug. 14) 1909; Serum Therapy and Vaccine Treatment of Acute Articular Rheumatism, abstr., ibid. **2**:805 (Sept. 11) 1909.

Rosenow [13] (1914) isolated 3 varieties of streptococcus from the blood and joints of rheumatic patients. One was green-producing, another slightly hemolytic and a third without striking features. He converted these varieties into one another by various procedures and claimed that by passage through animals they were converted into typical pneumococci.

Clawson [14] (1925) frequently found Streptococcus viridans in the blood of patients with rheumatic fever.

Small [15] and Birkhaug [16] (1927) independently isolated an inulin-fermenting gamma streptococcus from the blood and throats of rheumatic patients. This organism was a strong producer of toxin and caused rheumatoid lesions in animals.

Cecil, Nicholls and Stainsby [17] (1929) found positive cultures in 31 per cent of one series and 84 per cent of a second series of cases of rheumatism. All except two of their strains were Str. viridans. This was in contrast to their frequent finding of an attenuated hemolytic streptococcus in cases of rheumatoid arthritis. They cultured the blood clot, using an elaborate technic with numerous manipulations. It is interesting to note that Dawson, Olmstead and Boots [18] (1932), using the same technic in a comparable series of cases of rheumatoid arthritis, failed to confirm the findings of Cecil, Nicholls and Stainsby. The former authors stressed the possibility of accidental contaminations.

Jordan and Boland [19] (1930) found in 11 of 67 cases a short gram-negative bacillus. All their controls gave negative results.

In contrast to these positive findings, Philipp [20] (1903) failed to grow any organisms from the blood of 21 patients, using 20 different mediums.

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13. Rosenow, E. C.: Etiology of Acute Rheumatism, J. Infect. Dis. **14**:61, 1914.

14. Clawson, B. J.: Studies on the Etiology of Rheumatic Fever, J. Infect. Dis. **36**:444, 1925.

15. Small, J. C.: Bacterium Causing Rheumatic Fever, Am. J. M. Sc. **173**:101, 1927.

16. Birkhaug, K.: Rheumatic Fever: Bacteriologic Studies on Non-Methemoglobin-Forming Streptococcus, J. Infect. Dis. **40**:549, 1927.

17. Cecil, R. L.; Nicholls, E. E., and Stainsby, W. J.: Bacteriology of Blood and Joints in Rheumatic Fever, J. Exper. Med. **50**:617, 1929.

18. Dawson, M. H.; Olmstead, M., and Boots, R. H.: Bacteriologic Investigations on Blood, Synovial Fluids and Subcutaneous Nodules in Rheumatoid Arthritis, Arch. Int. Med. **49**:173 (Feb.) 1932.

19. Jordan, E. P., and Boland, J. P.: Results of Blood Cultures in Acute Polyarthritis, J. Infect. Dis. **46**:148, 1930.

20. Philipp, C.: Zur Aetiologie des akuten Gelenkrheumatismus, Deutsches Arch. f. klin. Med. **76**:150, 1903; cited by Thomson and Thomson,[10] p. 5.

Cole[21] (1904) failed to grow any bacteria from the blood and synovial fluid of his patients. Using various strains of streptococci he produced in animals lesions similar to those caused by M. rheumaticus of Poynton and Paine.[4]

Harrison[22] (1913) failed to isolate streptococci from the blood in 26 cases.

Swift and Kinsella[23] (1917) found streptococci in less than 10 per cent of their rheumatic patients, and cultures of material from the joints were all sterile.

Lynch[24] (1927), using Clawson's technic, found no positive cultures in 15 cases.

Irvine-Jones[25] (1928), Nye and Seegal[26] (1929) and Nye and Waxelbaum[27] (1930) failed to find any bacteremia in several carefully studied series of cases.

Margolis and Dorsey[28] (1930) were unable to recover organisms in cases of rheumatic fever, though they found a few cultures positive for green streptococci in cases of rheumatoid arthritis.

Using blood taken during life, Collis[29] (1931) found cultures of blood sterile in 11 cases; 4 cultures of material from the heart were also negative.

Cooley[30] (1932) studied 25 rheumatic children with active disease and 10 controls. He found cultures from both patients and controls negative except for occasional contamination with staphylococci and molds.

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21. Cole, R.: Experimental Streptococcus-Arthritis in Relation to the Etiology of Acute Articular Rheumatism, J. Infect. Dis. **1**:714, 1904.

22. Harrison, W. S.: On Streptococcus Rheumaticus and Rheumatic Fever, J. Roy. Army M. Corps **20**:1, 1913.

23. Swift, H. F., and Kinsella, R. A.: Bacteriologic Studies in Rheumatic Fever, Arch. Int. Med. **19**:381 (March) 1917.

24. Lynch, R.: Negative Blood Cultures in Acute Rheumatic Fever, Canad. M. A. J. **17**:1352, 1927.

25. Irvine-Jones, E.: Skin Sensitivity of Rheumatic Subjects to Streptococcal Filtrates, Arch. Int. Med. **42**:784 (Nov.) 1928.

26. Nye, R., and Seegal, D.: Non-Hemolytic Streptococcus and Acute Rheumatic Fever, J. Exper. Med. **49**:539, 1929.

27. Nye, R., and Waxelbaum, E. A.: Streptococci in Infectious Arthritis and Rheumatic Fever, J. Exper. Med. **52**:885, 1930.

28. Margolis, H. M., and Dorsey, A. H.: Bacteriology of Blood in Chronic Infectious Arthritis, J. Infect. Dis. **46**:443, 1930.

29. Collis, W. R. F.: Acute Rheumatism and Hemolytic Streptococci, Lancet **1**:1341 (June 20) 1931.

30. Cooley, L. E.: Blood Cultures in Rheumatic Fever, J. Infect. Dis. **50**:330, 1932.

Haymaker, Ekhart and Freund [31] (1932) studied 14 cases of rheumatic disease, using Löwenstein's technic for growing tubercle bacilli from the blood. All their cultures were negative.

McIntosh and Wood [32] (1935) found negative cultures in 6 cases and a nonhemolytic streptococcus in 1.

Meyer and Ryan [33] (1936), using Kendall's medium and a special technic, found no difference between normal and rheumatic children. They found a few diphtheroid bacilli, gram-positive cocci and giant cocci and stated that all these were contaminants.

In contrast to these two groups, one of which obtained positive results and the other negative, there are a number of workers who isolated bacteria from rheumatic patients but who also found them in nonrheumatic patients and in normal persons. Sellards and Bigelow [34] (1921), for instance, found a small pleomorphic gram-positive bacillus in 25 of 31 cases of measles. Koch and Mellon [35] (1930) found diphtheroid organisms present in the blood of 4 patients who previously had had cultures positive for green and gamma streptococci. They found diphtheroid organisms rarely in other diseases, except Hodgkin's disease, and suggested that they represent a dissociation phase of a virulent streptococcus.

Thompson [36] (1932), however, found diphtheroid bacilli in only 3 per cent of 1,079 cultures. He found no correlation between a positive culture and the clinical diagnosis and concluded that diphtheroids have the same significance in blood cultures as the saprophytic cocci.

Coburn [37] (1931) made blood cultures 221 times on 84 patients, using 21 different mediums. Fifteen were positive, the organisms comprising hemolytic and nonhemolytic streptococci, hemolytic staphylo-

31. Haymaker, W.; Ekhart, W., and Freund, J.: Results of Examination of Blood for Tubercle Bacilli by Löwenstein's Culture Method, J. Infect. Dis. **51**:562, 1932.

32. McIntosh, R., and Wood, C. L.: Rheumatic Infections Occurring in the First Three Years of Life, Am. J. Dis. Child. **49**:835 (April) 1935.

33. Meyer, E., and Ryan, W.: Bacteriologic Studies of Blood of Normal Individuals and Rheumatic Fever Patients, J. Lab. & Clin. Med. **22**:113, 1936.

34. Sellards, A. W., and Bigelow, G. H.: Investigation of the Virus of Measles, J. M. Research **42**:241, 1921.

35. Koch, R., and Mellon, H. R.: The Biological and Clinical Significance of Diphtheroids in the Blood Stream, J. Bact. **19**:25, 1930.

36. Thompson, L.: Occurrence of Diphtheroids in Blood Cultures, J. Infect. Dis. **50**:69, 1932.

37. Coburn, A. F.: The Factor of Infection in the Rheumatic State, Baltimore, Williams & Wilkins Company, 1931.

cocci and diphtheroid forms. He found similar organisms in a variety of diseases and concluded that none was directly responsible for rheumatic fever.

Lichtman and Gross [38] (1932) found alpha and gamma streptococci in 8 per cent of 188 cases of acute rheumatic fever and in 5 per cent of 126 cases of chronic rheumatism. They also found 4 per cent of their cultures positive in rheumatoid arthritis, 5 per cent in pernicious anemia, 4 per cent in meningococcic meningitis, 7 per cent in pyelitis and 15 per cent in aplastic anemia.

Wilson and Edmond [39] (1933) found bacteria in the blood of 37 per cent of their patients with active rheumatic fever and in the blood of 41 per cent of their patients with inactive rheumatism. They obtained positive cultures from 41 per cent of their nonrheumatic controls, from 26 per cent of their normal controls and from 54 per cent of their patients with infection of the upper respiratory tract. The organisms found included green and gamma streptococci and pleomorphic bacilli. The streptococci were not more frequently obtained from the rheumatic patients than from the controls. They concluded that a positive blood culture in rheumatic fever need not be considered of primary etiologic importance.

Reith and Squier [40] (1932) obtained positive cultures of blood from 27 per cent of a group of persons with chronic focal infections and also from 12 per cent of a group without demonstrable foci. The organisms included streptococci, diplococci, diphtheroid bacilli, Micrococcus catarrhalis, Bacillus coli and anaerobes. They found a seasonal variation in incidence and suggested that acute infection of the respiratory tract might have been responsible for some of the positive cultures.

An interesting piece of work was reported by Callow [41] in 1933. She frequently recovered alpha streptococci and pleomorphic bacilli from the blood of rheumatic and nonrheumatic patients. The type of organism bore no relation to the stage or type of the disease. There were no more positive cultures in cases of rheumatic than in those of nonrheumatic conditions.

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38. Lichtman, S. S., and Gross, L.: Streptococci in the Blood in Rheumatic Fever, Rheumatoid Arthritis and Other Diseases, Arch. Int. Med. **49**:1078 (June) 1932.

39. Wilson, M. G., and Edmond, H.: Blood Cultures in Children with Rheumatic Fever, Am. J. Dis. Child. **45**:1237 (June) 1933.

40. Reith, A. F., and Squier, T. L.: Blood Cultures in Healthy Persons, J. Infect. Dis. **51**:336, 1932.

41. Callow, B.: Bacteriologic Investigation of Blood in Rheumatic Fever, J. Infect. Dis. **52**:279, 1933.

The streptococci were of a variety of types but were chiefly Streptococcus faecalis. The types had no specific relation to rheumatic fever. The bacilli isolated from rheumatic and nonrheumatic patients were the same. Under controlled conditions 6 bacillary strains were transformed into cocci of the green and hemolytic types. These coccic derivatives were similar in all respects to the organisms originally isolated from the blood of rheumatic patients and from the blood of controls. A definite antigenic relation was established between bacillary strains and coccic derivatives and between original and derived cocci. Callow stated the opinion that the pleomorphic bacilli and the cocci apparently represent stages in the life cycle of the same organism and that a specific etiologic relation between these organisms and rheumatic fever is questionable.

It is clear from the foregoing summary that numerous workers have frequently obtained positive blood cultures from patients with rheumatic fever, but that no organism has been constantly isolated. Furthermore, a surprisingly large number of similar bacterial types have been isolated from normal persons or from those suffering from respiratory infections.

The findings reported in the literature interested us for two reasons: 1. Not one of a large number of routine blood cultures done in this hospital during the past ten years was positive for any organism commonly known as a pathogen unless the patient showed definite clinical signs of disease. 2. No culture of blood from a rheumatic patient was positive for a pathogenic organism unless the patient subsequently proved to have a subacute bacterial endocarditis (Sheplar [42]). In an occasional case cultures showed organisms considered to be accidental contaminants. These bacteria were usually diphtheroid organisms, large gram-positive cocci and large gram-positive bacilli.

Two possible explanations of our negative findings were at once apparent: (1) Our routine method [43] was inadequate, or (2) we were discarding as accidental contaminants certain organisms that were truly obtained from the circulating blood. Accordingly a group of cases was studied with a more elaborate technic.

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42. Sheplar, A. E.: Personal communication to the authors.

43. The arm is carefully scrubbed with iodine and alcohol. Fifteen cubic centimeters of blood is received in a closed suction (Taylor) tube containing 2 cc. of a sterile 10 per cent solution of sodium citrate. Blood is blown out of the side arm of the closed tube, which has previously been flamed, into two narrow-necked bottles containing 50 cc. each of beef infusion broth, one containing 1 per cent dextrose, the other 2 per cent dextrose. The $p_H$ is 7.4 and 7.6 respectively. Five cubic centimeters of blood is introduced into each flask. Two agar pour plates are made with the remaining 5 cc. of blood. The cultures are examined daily but are not opened and smeared unless growth is suspected. All cultures are held for two weeks before being discarded as negative.

## MATERIAL

There were 50 cultures of blood from 44 persons. The group comprised patients with rheumatism, active chorea or infection of the upper respiratory tract, nonrheumatic controls and normal controls.

The rheumatic fever was active in all cases. All rheumatic patients showed clinical signs of carditis; nearly all had an elevated temperature or a rapid rate of erythrocyte sedimentation. Not many showed frank arthritis. As often as possible the cultures were taken before salicylate therapy was begun. For 22 patients 26 blood cultures and one culture of pericardial exudate were made.

For 4 patients with active chorea 4 blood cultures were made. The number was limited, as only patients with severe illness were selected. Two of these showed evidence of cardiac involvement. The others presumably had chorea of the Sydenham type but showed no signs of active carditis.

For 9 patients with nonrheumatic disease 9 blood cultures were made. These were chiefly patients with appendicitis, empyema and the like in the postoperative period; all were afebrile. One patient was convalescing from pneumonia, one had cerebral concussion and one had persistent headache, finally determined to be due to a refractive error.

Two patients with infection of the upper respiratory tract were separated from other nonrheumatic patients. One of these had a severe tonsillitis, from which a beta type of streptococcus was recovered; at the time blood was taken for culture he had a temperature of 104 F. The other was a nurse who had an acute streptococcic sinus infection accompanied by pain in the joints and muscles and severe prostration. No evidence of true rheumatic disease was apparent.

The normal control tests comprised 8 cultures on 8 persons, interns and members of the laboratory staff. They were in normal health.

## TECHNIC

The cultures were all made by one person (C. J. L.). The transplants of the first 25 cultures were done by the other partner (M. J. S.). In the last 25 cultures the entire procedure was done by one person (C. J. L.).

The blood was taken from a vein of the arm after carefully scrubbing the arm with iodine and alcohol. Fifteen cubic centimeters were received into a closed suction (Taylor) tube in which there were 2 cc. of a sterile 10 per cent solution of sodium citrate. The specimen was taken immediately to the laboratory and the following procedure carried out:

Three original cultures were made in narrow-necked 100 cc. bottles, each containing 50 cc. of the following substances:

(1) Double beef infusion broth (1,000 Gm. beef per liter)..... $p_H$ 7.8
(2) Beef infusion broth with 1 per cent dextrose..... $p_H$ 7.4
(3) Beef infusion broth with 2 per cent dextrose..... $p_H$ 7.2

Five cubic centimeters of blood was introduced into each bottle and incubated at 37.5 C. for forty-eight hours.

The material was then subcultured as follows:

Three cubic centimeters from each bottle was pipetted off and 1 cc. transferred to each of three 10 cc. tubes of the following mediums:

(1) Beef infusion broth plus 1 cc. of human serum..... $p_H$ 7.6
(2) Chocolate blood broth.....
(3) Chopped beef heart broth with a petrolatum seal..... $p_H$ 7.6

At this time smears were made from the original bottles, a drop from the transferring pipet being used in order that one might avoid opening the bottle more than once. If results were positive, the bottle was opened again and subcultures were made in dextrose broth and streaked on blood agar plates.

Four of these subcultures were made altogether, the last 3 at weekly intervals. At each new transfer, 3 cc. of the original was divided among 3 fresh tubes as described, and the previous subcultures were smeared. The original cultures were also smeared at this time.

Long, narrow anaerobic tubes of brain broth were also employed in 12 instances. These were smeared after two weeks by means of a capillary pipet and again at the end of five weeks, when they were discarded.

Cultures were kept at least four weeks before being discarded as negative.

After the first 25 cultures had been completed, it was decided to discard the 2 per cent dextrose broth, the brain broth and the chocolate broth as they appeared to offer no advantage. Subsequent cultures were therefore made in the 1 per cent dextrose and double beef broths and transplanted as described to 10 per cent serum broth and to an anaerobic tube of chopped beef heart broth.

All of these procedures were done in a room separated from the main laboratory. Although the manipulations were not done under a hood, great care was taken to prevent draughts and the room was kept as free from dust as possible in order to minimize air-borne contamination. In addition, during the various procedures blood agar plates were exposed on the work tables and the various air-borne organisms so grown were noted.

## RESULTS

The results are summarized in tables 1 to 6.

*Patients with Rheumatism.*—Twenty of 26 primary cultures were negative. In not a single instance was there a positive culture in any of the original bottles after forty-eight hours' incubation. In no instance was an organism ever found in more than 1 of 2 or 3 primary cultures.

Eleven of the 26 cultures were negative throughout all steps of the procedure.

Organisms were recovered in 15 of the 26 cultures, usually from only a few of the subcultures in each case. These bacteria included large gram-positive bacilli and cocci, diphtheroid organisms and staphylococci. The organisms grown appeared generally after the primary bottles had been opened for subculture at least twice, and in all but 1 instance were repeatedly grown on the blood agar plates exposed to the air of the room.

Seven anaerobic brain broth cultures were made in this group. Five of these were negative; 2 showed diphtheroid bacilli.

A pathogenic organism was recoved in 1 case (F. V.). This was a hemolytic strain of Staph. aureus found in 1 of 2 primary bottles after one week's incubation. Staphylococci grow so readily that one would expect a blood-borne organism to appear in both bottles within forty-eight hours. The patient, moreover, showed none of the physical signs characteristic of this type of bacteremia and is alive at present.

TABLE 1.—*Patients with Rheumatism (First Series)*

| Case | Date | Primary Cultures | | | Subcultures | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1% Dextrose | | | 2% Dextrose | | | Double Beef | | |
| | | 1% Dextrose | 2% Dextrose | Double Beef | S.B. | C.B. | An. | S.B. | C.B. | An. | S.B. | C.B. | An. |
| R. H. 1 | 1/12/35 | — | — | — | | | | | | | | | |
| | 1/14/35 | — | — | — | — | — | — | — | — | C | — | — | — |
| | 1/21/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 1/26/35 | — | — | — | — | — | — | — | — | — | — | — | C |
| | 2/ 9/35 | — | — | C | — | — | — | — | — | — | — | — | C |
| R. H. 2 | 1/12/35 | — | — | — | — | — | — | — | — | C | — | — | — |
| | 1/14/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 1/19/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 1/26/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/ 9/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| R. H. 3 | 2/ 6/35 | — | — | — | | | | | | | | | |
| | 2/ 8/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/13/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/20/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/27/35 | — | — | — | — | — | — | — | B | — | — | — | — |
| | 3/ 4/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| R. H. 4 | 2/ 6/35 | — | — | — | | | | | | | | | |
| | 2/ 8/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/13/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/20/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/29/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 3/ 4/35 | — | — | — | — | B | — | C | B | D | — | B | — |
| R. H. 5 | 2/18/35 | — | — | — | | | | | | | | | |
| | 2/20/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/27/35 | — | — | — | — | — | — | — | — | — | D | D | — |
| | 3/ 6/35 | — | — | D | — | D | — | — | — | — | D | D | D |
| | 3/13/35 | — | — | D | — | — | — | — | — | — | D | D | D |
| | 3/20/35 | — | — | D | — | — | — | — | — | — | D | D | D |
| R. H. 6 | 2/23/35 | — | — | — | | | | | | | | | |
| | 2/25/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 3/ 4/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 3/11/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 3/18/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 3/25/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| R. H. 7 | 4/25/35 | — | — | — | | | | | | | | | |
| | 5/ 3/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/10/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/17/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/24/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 6/ 1/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| R. H. 8 | 4/25/35 | — | — | — | | | | | | | | | |
| | 5/ 3/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/10/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/17/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/24/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 6/ 1/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| R. H. 9 | 4/25/35 | — | — | — | | | | | | | | | |
| | 5/ 3/35 | — | — | — | — | — | — | C | C | — | — | — | — |
| | 5/10/35 | — | — | — | — | — | — | C | — | — | — | 4 | — |
| | 5/17/35 | — | — | — | — | — | — | C | D | C | — | — | — |
| | 5/24/35 | — | — | — | B | — | — | C | C | — | — | — | — |
| | 6/ 1/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| R. H. 10 | 5/ 1/35 | — | — | — | | | | | | | | | |
| | 5/ 9/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/16/35 | — | — | — | — | — | C | — | — | — | D | D | — |
| | 5/23/35 | — | — | — | — | — | — | — | B | — | D | D | D |
| | 5/30/35 | — | — | D | — | — | — | — | — | — | — | — | — |
| R. H. 11 | 5/ 1/35 | — | — | — | | | | | | | | | |
| | 5/ 9/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/16/35 | — | — | — | B | — | — | — | — | — | — | — | — |
| | 5/23/35 | — | — | — | — | — | C | B | B | B | B | B | B |
| | 5/30/35 | — | — | B | — | — | — | B | B | — | B | B | — |
| R. H. 12 | 5/ 1/35 | — | — | — | | | | | | | | | |
| | 5/ 9/35 | — | — | — | C | C | C | — | — | — | — | — | — |
| | 5/16/35 | — | — | — | C | C | C | — | — | — | — | — | — |
| | 5/23/35 | — | — | — | C | C | C | C | C | C | — | — | — |
| | 5/30/35 | C | — | — | C | C | C | C | C | C | — | — | — |

Scheme.—S.B. = serum broth subculture; C.B. = chocolate broth subculture; An. = anaerobic chopped beef broth subculture; B = large gram-positive bacillus; C = large gram-positive coccus; D = diphtheroid; — = negative culture; 1%dextrose, 2% dextrose, double beef = primary cultures.

TABLE 2.—*Patients with Rheumatism (Second Series)*

| Case | Date | Primary | | Subcultures | | | |
|---|---|---|---|---|---|---|---|
| | | | | 1% Dextrose | | Double Beef | |
| | | 1% Dextrose | Double Beef | S.B. | An. | S.B. | An. |
| S. M. | 1/28/36 | — | — | | | | |
| | 1/30/36 | — | — | — | — | — | — |
| | 2/ 6/36 | — | — | — | — | — | — |
| | 2/13/36 | D | — | D | — | — | — |
| | 2/20/36 | D | — | D | — | — | — |
| | 2/27/36 | D | — | D | — | — | — |
| J. R. 1 | 1/28/36 | — | — | | | | |
| | 1/30/36 | — | — | — | — | — | — |
| | 2/ 6/36 | — | — | — | — | — | — |
| | 2/13/36 | — | — | — | — | — | — |
| | 2/20/36 | — | — | D | — | — | — |
| | 2/29/36 | — | — | — | — | — | — |
| J. R. 2 | 2/22/36 | — | — | | | | |
| | 2/24/36 | — | — | — | — | — | — |
| | 3/ 2/36 | — | — | — | — | — | — |
| | 3/10/36 | — | — | — | — | — | — |
| | 3/16/36 | — | — | — | — | — | — |
| | 3/23/36 | — | — | — | — | — | — |
| D. L. | 3/22/36 | — | — | | | | |
| | 2/24/36 | — | — | — | — | — | — |
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| | 3/10/36 | — | — | — | — | — | — |
| | 3/16/36 | — | — | — | — | — | — |
| | 3/23/36 | — | — | — | — | — | — |
| M. M. | 3/12/36 | — | — | | | | |
| | 3/14/36 | — | — | — | — | — | — |
| | 3/23/36 | — | — | — | — | — | — |
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| | 4/ 5/36 | — | — | — | — | — | — |
| | 4/18/36 | — | D | — | B | — | — |
| J. M. | 3/16/36 | — | — | | | | |
| | 3/18/36 | — | — | — | — | — | — |
| | 3/31/36 | — | — | — | — | — | — |
| | 4/ 8/36 | — | — | — | — | — | — |
| | 4/18/36 | — | — | — | — | — | — |
| | 5/ 4/36 | — | — | — | — | — | — |
| V. G. | 2/ 9/36 | — | — | | | | |
| | 2/11/36 | — | — | — | — | — | — |
| | 2/18/36 | — | — | — | — | — | — |
| | 2/25/36 | — | — | — | — | — | — |
| | 3/ 3/36 | — | — | — | — | — | — |
| | 3/10/36 | — | — | — | — | — | — |
| F. V. | 3/ 2/36 | — | — | | | | |
| | 3/ 4/36 | — | — | — | — | — | — |
| | 3/11/36 | H.S. | — | H.S. | H.S. | — | — |
| | 3/18/36 | | — | | | — | — |
| | 3/31/36 | | — | | | — | — |
| | 4/ 8/36 | | — | | | — | — |
| S. S. | 1/16/36 | | | | | | |
| | 1/18/36 | — | — | | | | |
| | 1/25/36 | — | — | — | — | — | — |
| | 2/ 1/36 | — | — | — | — | — | — |
| | 2/ 8/36 | — | — | — | — | — | — |
| | 2/15/36 | — | — | — | — | — | — |
| J. L. 1 | 1/16/36 | | | | | | |
| | 1/18/36 | — | — | | | | |
| | 1/25/36 | — | — | — | — | — | — |
| | 2/ 1/36 | — | — | — | — | — | — |
| | 2/ 8/36 | — | — | — | — | — | — |
| | 2/15/36 | — | — | — | — | — | — |
| J. L. 2 | 2/ 9/36 | | | | | | |
| | 2/11/36 | — | — | | | | |
| | 2/18/36 | — | — | — | — | — | — |
| | 2/25/36 | — | C | — | — | — | — |
| | 3/ 3/36 | — | C | C | C | — | — |
| | 3/10/36 | — | | C | C | — | — |
| S. C. 1 | 1/16/36 | | | | | | |
| | 1/18/36 | — | — | | | | |
| | 1/25/36 | — | — | — | — | — | — |
| | 2/ 1/36 | — | — | — | — | — | — |
| | 2/ 8/36 | — | — | — | — | — | — |
| | 2/15/36 | — | — | — | — | — | — |
| S. C. 2 | 1/28/36 | | | | | | |
| | 1/30/36 | — | — | | | | |
| | 2/ 6/36 | — | S | — | — | — | — |
| | 2/13/36 | — | | — | — | S | S |
| | 2/20/36 | D | | — | — | | |
| | 2/29/36 | — | | — | — | | |
| S. C. 3 | 3/12/36 | | | | | | |
| | 3/14/36 | — | — | | | | |
| | 3/23/36 | — | — | — | — | — | — |
| | 3/31/36 | — | — | — | — | — | — |
| | 4/ 5/36 | — | — | — | — | — | — |
| | 4/18/36 | — | — | — | — | — | — |

Scheme.—H.S. = hemolytic Staphylococcus aureus; S = Staphylococcus albus; C = large gram-positive cocci; D = diphtheroid; — = negative culture.

two years after the culture was made. Undoubtedly contamination occurred when the original culture was opened for the first subculture.

TABLE 3.—*Patients with Chorea*

| | | Primary Cultures | | | Subcultures | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1% Dextrose | | | 2% Dextrose | | | Double Beef | | |
| Case | Date | 1% Dextrose | 2% Dextrose | Double Beef | S.B. | C.B. | An. | S.B. | C.B. | An. | S.B. | C.B. | An. |
| C. H. 1 | 1/16/35 | — | — | — | | | | | | | | | |
| | 1/18/35 | — | — | — | — | — | — | | | | — | — | — |
| | 1/23/35 | — | Contaminated | — | — | — | — | Contaminated | | | — | — | — |
| | 1/35/35 | — | Contaminated | — | — | — | — | Discontinued | | | — | — | — |
| | 2/ 6/35 | — | Contaminated | — | — | — | — | | | | — | — | — |
| | 2/13/35 | — | Contaminated | — | — | — | — | | | | — | — | — |
| C. H. 2 | 2/ 8/35 | — | — | — | | | | | | | | | |
| | 2/10/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/15/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/22/35 | — | — | C | — | — | D | — | — | — | C | D | C |
| | 3/ 1/35 | — | — | | — | — | — | — | — | — | | | |
| | 3/ 8/35 | — | — | | — | — | — | — | — | — | | | |
| C. H. 3 | 4/29/35 | — | — | — | | | | | | | | | |
| | 5/ 8/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/15/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/22/35 | — | — | — | — | — | — | — | — | — | B | — | — |
| | 5/29/35 | — | F | B | C | C | C | C | C | C | B | B | B |
| C. H. 4 | 4/29/35 | — | — | — | | | | | | | | | |
| | 5/ 8/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/15/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/22/35 | — | — | — | — | — | — | — | — | — | B | — | — |
| | 5/30/35 | — | — | — | — | — | — | — | — | — | — | — | — |

Scheme.—B = large gram-positive bacillus; C = large gram-positive coccus; F = contaminated filament; D = diphtheroid.

TABLE 4.—*Controls with Infection of the Upper Respiratory Tract*

| | | Primary Cultures | | | Subcultures | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1% Dextrose | | | 2% Dextrose | | | Double Beef | | |
| Case | Date | 1% Dextrose | 2% Dextrose | Double Beef | S.B. | C.B. | An. | S.B. | C.B. | An. | S.B. | C.B. | An. |
| No. 1 | 1/19/35 | — | — | — | | | | | | | | | |
| | 1/21/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 1/26/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/ 3/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/11/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/18/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| No. 2 | 3/ 2/36 | — | | | | | | | | | | | |
| | 3/ 4/36 | — | | D | — | | — | | | | D | | — |
| | 3/11/36 | — | | D | — | | — | | | | D | | — |
| | 3/18/36 | — | | D | — | | — | | | | D | | — |
| | 3/31/36 | — | | D | — | | — | | | | D | | — |
| | 4/ 8/36 | — | | D | — | | — | | | | D | | — |

Scheme.—D = diphtheroids; — = negative culture.

The culture of pericardial fluid was negative throughout.

*Patients with Chorea.*—No pathogenic organism was found in any case. No organism developed in any primary culture until after the container had been opened at least twice. One culture showed gram-positive bacilli and cocci as well as a filament; another showed gram-

positive cocci and diphtheroid bacilli; one was grossly contaminated in 1 of 3 bottles, with the others sterile; a third showed a gram-positive rod in 1 of 36 subcultures. One of the anaerobic brain broth cultures showed a gram-positive bacillus, the rest being sterile.

TABLE 5.—*Nonrheumatic Controls*

| | | Primary | | Subcultures | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 1% Dextrose | | Double Beef | | |
| Case | Date | 1% Dextrose | Double Beef | S.B. | An. | S.B. | An. | Diagnosis |
| M. S. | 10/15/36 | — | — | .. | .. | .. | .. | Chronic appendicitis |
| | 10/17/36 | — | — | | | — | — | |
| | 10/24/36 | C | — | — | — | — | — | |
| | 10/31/36 | | — | C | C | — | — | |
| | 11/ 6/36 | | — | | | — | — | |
| | 11/21/36 | | — | | | — | — | |
| M. W. | 10/17/36 | — | — | .. | .. | .. | .. | Acute appendicitis |
| | 10/24/36 | — | C | — | — | C | — | |
| | 10/31/36 | — | | — | — | C | C | Convalescent |
| | 11/ 6/36 | — | | — | C | | | |
| | 11/21/36 | — | | — | — | | | |
| P. M. | 10/18/36 | — | — | | | | | |
| | 10/24/36 | — | — | — | — | — | — | Acute appendicitis |
| | 10/31/36 | — | — | — | — | — | — | |
| | 11/ 6/36 | — | — | — | — | — | — | Convalescent |
| | 11/21/36 | — | — | — | — | — | — | |
| F. E. | 10/18/36 | — | — | | | | | |
| | 10/24/36 | — | — | — | — | — | — | Hypospadias |
| | 10/31/36 | — | — | — | — | C | — | |
| | 11/ 6/36 | — | C | — | — | — | — | |
| | 11/21/36 | — | B & C | — | — | B & C | B & C | |
| D. V. | 10/18/36 | — | — | | | | | |
| | 10/24/36 | — | C | — | — | C | C | Cerebral concussion |
| | 10/31/36 | — | | — | — | C | — | |
| | 11/ 6/36 | — | | — | — | | | |
| | 11/21/36 | C | | — | — | | | |
| A. T. | 10/24/36 | — | — | | | | | |
| | 10/31/36 | — | C | — | — | — | — | |
| | 11/ 6/36 | — | | — | — | C | C | Chronic appendicitis |
| | 11/22/36 | — | | — | — | | | |
| | 12/ 6/36 | — | | — | C | | | |
| C. S. | 10/24/36 | — | — | | | | | |
| | 10/31/36 | — | — | — | — | — | — | |
| | 11/ 6/36 | — | — | — | — | — | — | Convalescent pneumonia |
| | 11/22/36 | — | Y | — | — | Y | — | |
| | 12/ 6/36 | — | Y | — | — | Y | — | |
| G. G. | 10/31/36 | — | — | | | | | |
| | 11/ 6/36 | — | — | — | — | — | — | Convalescent empyema |
| | 11/22/36 | — | — | — | — | — | — | |
| | 12/ 2/36 | — | C | — | — | C | — | |
| A. C. | 10/31/36 | — | — | | | | | |
| | 11/ 6/36 | — | C | — | C | C | C | Headache due to refractive error |
| | 11/22/36 | — | C | — | C | C | C | |
| | 12/ 6/36 | — | | — | C | C | — | |

Scheme.—B = large gram-negative bacillus; C = large gram-negative coccus; Y = yeast; S.B. = serum broth subcultures; An. = chopped beef broth anaerobic subcultures.

*Infection of the Upper Respiratory Tract.*—No pathogenic organism was found in either case. The cultures of blood from the patient with septic sore throat were entirely negative. One primary culture of blood from the patient with sinusitis and pain in the muscles showed a diphtheroid organism after forty-eight hours, the other culture remaining negative.

*Nonrheumatic Controls.*—No pathogenic organisms were found in these cases. In only 1 case were bacteria found in both primary bottles; in this, 1 bottle showed a large gram-positive coccus after

TABLE 6.—*Normal Controls*

| | | Primary Cultures | | | Subcultures | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1% Dextrose | | | 2% Dextrose | | | Double Beef | | |
| Case | Date | 1% Dextrose | 2% Dextrose | Double Beef | S.B. | C.B. | An. | S.B. | C.B. | An. | S.B. | C.B. | An. |
| No. 1 | 1/12/35 | — | — | — | | | | | | | | | |
| (G. B.) | 1/14/35 | — | — | — | — | — | — | — | — | C | — | — | — |
| | 1/19/35 | Strep. | — | — | Strep. | Strep. | — | — | — | — | — | — | — |
| | 1/26/35 | | — | — | | | | — | — | — | — | — | — |
| | 2/ 9/35 | | — | — | | | | — | — | — | — | — | — |
| No. 2 | 1/12/35 | — | — | — | | | | | | | | | |
| | 1/14/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 1/19/35 | — | — | — | — | — | — | — | — | — | — | — | — |
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| | 1/29/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| No. 3 | 1/19/35 | — | — | — | | | | | | | | | |
| | 1/21/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 1/26/35 | — | — | — | — | — | — | — | — | — | — | — | — |
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| | 2/18/35 | C | — | — | C | C | C | — | — | — | D | — | — |
| No 4 | 2/ 8/35 | — | — | — | | | | | | | | | |
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| | 2/15/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 2/22/35 | — | — | — | — | — | D | — | — | — | — | — | — |
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| | 3/ 8/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| No. 5 | 2/18/35 | — | — | — | | | | | | | | | |
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| | 2/27/35 | — | — | — | — | — | — | — | — | — | — | — | — |
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| | 3/20/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| No. 6 | 2/23/35 | — | — | — | | | | | | | | | |
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| | 3/11/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 3/18/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 3/25/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| No. 7 | 4/25/35 | — | — | — | | | | | | | | | |
| | 4/27/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/ 3/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/10/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/17/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/24/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/31/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| No. 8 | 5/10/35 | — | — | — | | | | | | | | | |
| | 5/12/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/19/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 5/26/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 6/ 3/35 | — | — | — | — | — | — | — | — | — | — | — | — |
| | 6/10/35 | — | — | — | — | — | — | — | — | — | — | — | — |

Scheme.—Primary cultures: 1% dextrose broth, 2% dextrose broth, double beef broth; S.B. = 10% serum broth subculture; C.B. = chocolate broth subculture; An. = anaerobic chopped beef broth subcultures; Strep. = Streptococcus faecalis; B = large gram-positive bacillus; C = large gram-positive coccus; D = diphtheroid.

forty-eight hours, while the other failed to show growth until after being opened four times for subculture. In 1 case there was a mixture of cocci and bacilli in the last subculture of one bottle; in another case there was contamination with a yeast.

*Normal Controls.*—One pathogenic organism was encountered (control G. B.). This was Str. faecalis, found in one of three primary

cultures after forty-eight hours' incubation. Both other bottles and their subcultures remained sterile for four weeks.

The person from whom the blood for culture was taken was a house surgeon who had just finished dressing a patient who had had a cystotomy. We feel that in such circumstances an accidental contamination is probable.

Cultures of material from 5 of the 8 persons were entirely negative. There was a gram-positive coccus in 1 original bottle after it had been opened four times; the fourth subculture from the other primary bottle in this case showed a diphtheroid organism in 1 of 3 tubes. A culture of material from another person showed a diphtheroid organism in only 1 of 36 subcultures. Anaerobic cultures were done on the blood of 4 persons, 1 culture showing a gram-positive bacillus.

*Air Cultures.*—The blood agar plates exposed during the various procedures grew a number of the common saprophytes ordinarily found in a laboratory. These included pleomorphic bacilli (Corynebacterium) and large gram-positive rods similar to Bacillus subtilis. There were also several varieties of Staphylococcus epidermidis albus, Sarcina lutea and large gram-positive cocci (Micrococcus).

## SUMMARY AND CONCLUSION

It is clear from the preceding analysis that we were able to recover pathogenic organisms from only 2 persons in the entire group. One was obtained from a rheumatic patient and the other from a normal control. We feel quite certain, for reasons previously offered, that both were accidental contaminants and did not indicate true bacteremia.

It is a striking fact that the vast majority of positive findings were noted only after several manipulations of the original cultures. Furthermore, the organisms were never constantly present in all of the primary bottles, but generally were found in only 1 of 2 or 3 of them and in occasional subcultures. The frequent finding of 2 or more organisms together in a given case is a further objection to their authenticity. We deem it especially significant that the organisms so recovered were also readily grown from the air of our laboratory.

We therefore conclude that in the cases studied bacteremia was not demonstrable and that the organisms encountered were air-borne contaminants introduced during repeated manipulations of the cultures.

# DIET IN THE TREATMENT OF DIABETES MELLITUS IN CHILDREN

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Prior to the introduction of insulin, diet was practically the sole factor in the treatment of diabetes mellitus. The principle of treatment in the later portion of the preinsulin period was induction of marked undernutrition [1] and employment of diets high in fat and low in carbohydrate.[2] Since 1922 there has been a gradual transition in most parts of the country toward use of what might be termed normal or average diets. In fact, the aim of treatment of diabetic children has changed from mere prolongation of life to maintenance of adequate growth and normal activity. There are, however, distinct differences of opinion regarding the qualitative and quantitative content of the diet. In the main, the tendency has been toward a more liberal allowance of carbohydrate. Credit for this is due largely to Sansum,[3] Geyelin [4] and Adlersberg and Porges.[5] With increased feeding of carbohydrate these observers, as well as others, noted improved tolerance as represented by increased efficiency of the injected insulin. In some instances no increase in the dose of insulin was required, whereas in others an actual

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From the Children's Hospital Research Foundation and the Department of Pediatrics, University of Cincinnati, College of Medicine.

A portion of the data was secured at the Camp for Diabetic Children, Glendale, Ohio. This camp was made possible in the summer of 1936 by a small group of Cincinnati citizens and was operated under the direction of the staff of the Children's Hospital.

1. Allen, F. M.; Stillman, Edgar, and Fitz, Reginald: Total Dietary Regulation in the Treatment of Diabetes, Monograph 11, Rockefeller Institute for Medical Research, 1919.

2. (*a*) Naunyn, Bernhard: Der Diabetes mellitus, ed. 2, Vienna, A. Hölder, 1906. (*b*) Newburgh, L. H., and Marsh, P. L.: Use of a High Fat Diet in the Treatment of Diabetes Mellitus, Arch. Int. Med. **26**:647-662 (Dec.) 1920.

3. Sansum, W. D.; Blatherwick, N. R., and Bowden, R.: The Use of High Carbohydrate Diets in the Treatment of Diabetes Mellitus, J. A. M. A. **86**:178-181 (Jan. 16) 1926.

4. Geyelin, H. R.: Recent Studies on Diabetes in Children, Atlantic M. J. **29**:825-830, 1926.

5. Adlersberg, D., and Porges, O.: Zur Theorie und Praxis der kurativen Diabetesbehandlung, Klin. Wchnschr. **5**:1451-1455, 1926.

decrease was possible, and rarely was it necessary to increase the insulin in proportion to the increase in carbohydrate. Adlersberg and Porges,[5] as well as Rabinowitch[6] and others, stated that the increase in tolerance for carbohydrates is due to the low fat content of the diet. Geyelin,[7] however, who prescribed high carbohydrate, moderate fat diets, was not in accord with this view. Nor did he believe that moderate undernutrition, as generally advocated, was essential.

The types of diets currently employed may be grouped in general as follows: low carbohydrate, high fat;[8] moderate carbohydrate, high fat;[9] moderate carbohydrate, moderate fat;[10] high carbohydrate, low fat;[11] high carbohydrate, moderate fat;[12] limited carbohydrate, with other portions unlimited,[13] and unrestricted.[14] It should be recognized that these groups overlap and that in practice most of the advocates of the various types of diet vary their prescriptions within a wide range in adjusting the diet to the individual child. There is no exact division between high and low carbohydrate diets. For the older child, however, we have classified diets containing less than 100

6. Rabinowitch, I. M.: Experiences with High Carbohydrate, Low Calorie Diet for the Treatment of Diabetes Mellitus, Canad. M. A. J. **23**:489-498, 1930; Effects of High Carbohydrate-Low Calorie Diet upon Carbohydrate Tolerance in Diabetes Mellitus, ibid. **33**:136-144, 1935.

7. Geyelin, H. R.: The Treatment of Diabetes with Insulin (After Ten Years): Contrasting Effects of Normal and of Older Diabetic Diets, J. A. M. A. **104**:1203-1208 (April 6) 1935.

8. Petrén, H.: Ueber die Gründe der diätetischen Behandlung des Diabetes, besonders des Diabetes gravis, München. med. Wchnschr. **74**:1123-1127, 1927. Newburgh and Marsh.[2b]

9. Sprague, R. G.; Blum, B. B.; Osterberg, A.; Kepler, E. J., and Wilder, R. M.: Clinical Observations with Insulin Protamine Compound, J. A. M. A. **106**:1701-1705 (May 16) 1936.

10. Joslin, E. P.: Treatment of Diabetes Mellitus, ed. 5, Philadelphia, Lea & Febiger, 1935.

11. Adlersberg and Porges.[5] Rabinowitch.[6]

12. Gray, P. A., and Sansum, W. D.: Higher Carbohydrate Diet Method in Diabetes Mellitus: Analysis of 1,005 Cases, J. A. M. A. **100**:1580-1584 (May 20) 1933. Eason, J., and Lyon, D. M.: High Carbohydrate Diets in Diabetes, Lancet **1**:743-745, 1933. Graham, G.; Clark, A., and Roberton, H. E. W.: High Carbohydrate Diet in Treatment of Diabetes Mellitus, ibid. **2**:990-993, 1932.

13. (*a*) Lawrence, R. D.: Address on Diabetes, with Special Reference to High Carbohydrate Diets, Brit. M. J. **2**:517-521, 1933. (*b*) Butler, A. M.: Dietary Management of Diabetics at Diabetic Clinic of Infants' and Children's Hospitals, Boston, Mass., New England J. Med. **212**:760-763, 1935. (*c*) Herlitz, C. W.: Studien über den Krankheitsverlauf und die Therapie des Diabetes mellitus bei Kindern, Acta pædiat. (supp. 2 [art. 1]) **18**:1-66, 1935.

14. Stolte, K.: Frei Diät beim Diabetes, Med. Klin. **27**:831-838, 1931. Söderling, B.: Behandlung der Zuckerkrankheit im Kindesalter ohne Diäteinschränkungen, Acta pædiat. (supp. 2 [art. 2]) **18**:1-41, 1935.

Gm. as low carbohydrate, those containing between 100 and 200 Gm. as moderate carbohydrate and those containing over 200 Gm. as high carbohydrate. If one accepts the fact that diabetic children have been successfully treated with each of these diets, it does not seem illogical to assume that the range within which they may be fed satisfactorily is as great or greater than that represented by the diets. In some instances it appears obvious that the chief argument in favor of a particular diet, as insisted on by a given author, is his success with it. Naturally, adequate supervision by the physician is essential in the successful management of diabetic children, but simply because a particular plan leads to satisfactory control of a group of children it does not necessarily follow that other manipulation of the diet may not be equally satisfactory when all factors are taken into consideration.

Numerous advantages are claimed for the higher carbohydrate diets. Among those which seem to have particular merit are the lower cost of the diet, its greater palatability and particularly its approximation to the average diet, so that all the members of the family may partake of it. The last is an important psychologic factor in the treatment of children. The actual efficiency of the diet, however, is often measured in terms of the units of insulin required to balance it. Reference has been made to the claim by the advocates of higher carbohydrate feeding for a greater efficiency in the utilization of insulin. An example is illustrated in chart 1 of a child who tolerated an increase of 25 per cent (from 160 to 200 Gm.) in the daily intake of carbohydrate without the necessity of an increase in the dose of insulin. These data were compiled from records kept by the child and for that reason are open to criticism; however, this girl was one of the more intelligent of our group, and we have every reason to believe that she kept better than average records. Such observations are not unusual and have been reported frequently. On the other hand, we have observed the need for more insulin with or without an increase in the carbohydrate in the diet and have considered it essential to adjust the dose of insulin empirically as need demanded; in most instances we have instructed the mothers of the children, as well as the older children, to make such adjustments.

Attempts have been made by MacBryde [15] and Himsworth [16] to determine whether the response of diabetic persons to increased carbohydrate feeding could be differentiated on the basis of so-called insulin resistance and insulin sensitivity. Relative insulin sensitivity or relative

15. MacBryde, C. M.: Response to Insulin as Index to Dietary Management of Diabetes, J. Clin. Investigation **15**:577-589, 1936.

16. Himsworth, H. P.: Diabetes Mellitus: Its Differentiation into Insulin-Sensitive and Insulin-Insensitive Types, Lancet **1**:127-130, 1936.

insulin resistance was determined by these authors on the basis of the response of the sugar content of the capillary blood to injected insulin. Marked lowering of the sugar content was interpreted as evidence of relative insulin sensitivity, and only slight lowering, as evidence of relative insulin resistance. Himsworth performed simultaneous determinations of the sugar content on capillary and on venous blood to

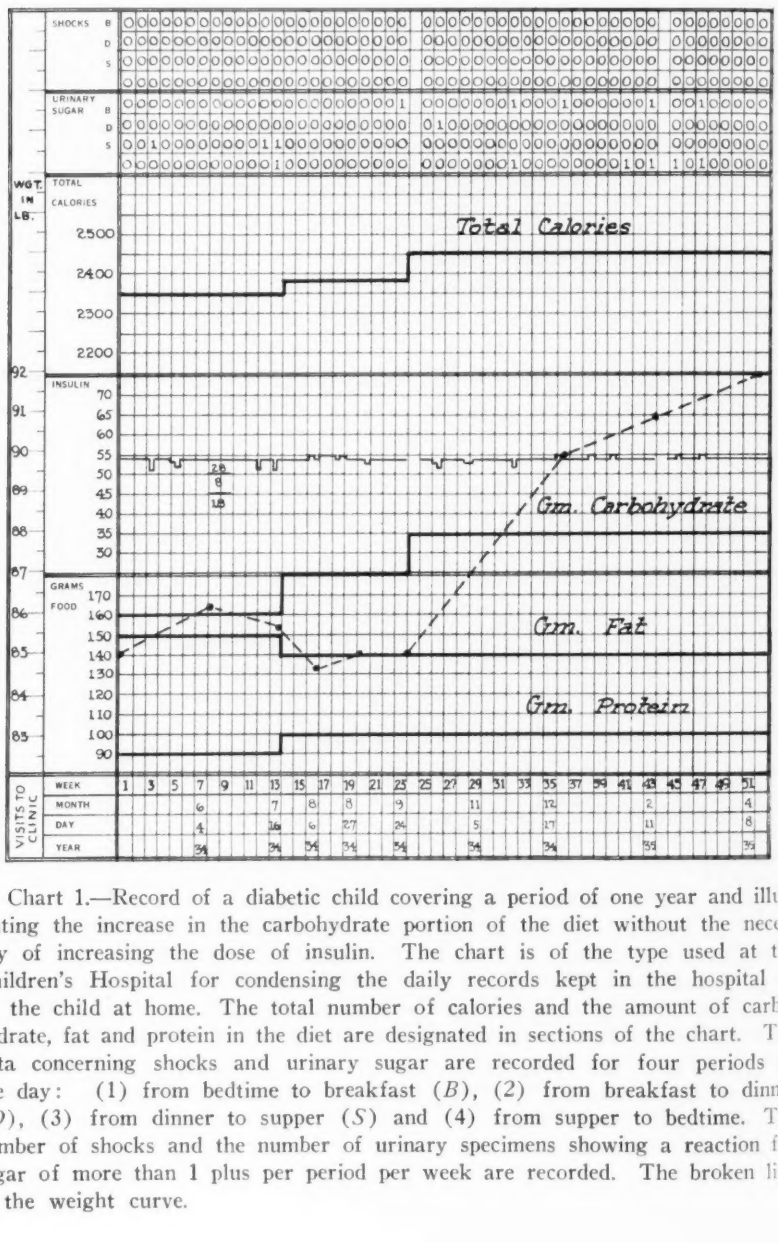


Chart 1.—Record of a diabetic child covering a period of one year and illustrating the increase in the carbohydrate portion of the diet without the necessity of increasing the dose of insulin. The chart is of the type used at the Children's Hospital for condensing the daily records kept in the hospital or by the child at home. The total number of calories and the amount of carbohydrate, fat and protein in the diet are designated in sections of the chart. The data concerning shocks and urinary sugar are recorded for four periods of the day: (1) from bedtime to breakfast (*B*), (2) from breakfast to dinner (*D*), (3) from dinner to supper (*S*) and (4) from supper to bedtime. The number of shocks and the number of urinary specimens showing a reaction for sugar of more than 1 plus per period per week are recorded. The broken line is the weight curve.

determine the so-called arteriovenous difference after the injection of insulin. A marked difference was interpreted as an indication of insulin sensitivity, and a slight difference, of insulin insensitivity. MacBryde found that relatively insulin-sensitive diabetic patients did not gain tolerance with high carbohydrate diets, whereas relatively resistant patients invariably gained tolerance as the carbohydrate portion of the diet was increased. In contrast, Himsworth's observations showed that insulin-sensitive patients gained tolerance with an increase in carbohydrate, while insulin-resistant patients lost tolerance. In spite of the lack of agreement in the conclusions of these two authors, there seem to be quantitative differences in the response of diabetic persons to qualitative changes in their diets. What factors influence these differences are not clear.

## EXPERIMENTAL OBSERVATIONS

Last summer in a camp for diabetic children six of the children were permitted a free choice of diet during the latter part of the camp period. They were served their regularly prescribed diet and then were allowed weighed portions of any of the available foods which they desired. Accurate records were kept of each child's intake at each meal. Qualitative urinalyses were performed at 8 a. m., 12 noon, 5 p. m. and 9 p. m., and the sugar content of the capillary blood was determined at 8 a. m., 12 noon and 5 p. m. The children were chosen primarily on the basis of a satisfactory psychologic adjustment. The purpose of the "free diet" period was explained to them, and they were told that they were to resume measured diets at the completion of the period of observation. The results of this experiment are shown in chart 2. The length of the observation was obviously too short to permit the drawing of conclusions. The results, however, are interesting, particularly because of their variability.

In view of these observations it was decided to bring one of the children (D. S.) into the hospital for more detailed study on different types of diets. He was given a diet consisting of 200 Gm. of carbohydrate, 100 Gm. of protein and 120 Gm. of fat. Determinations of the sugar content of the capillary blood and qualitative urinalyses for sugar were performed at 8 a. m., 11 a. m., 4 p. m. and 8 p. m. Quantitative urinalyses for sugar were also done on the twenty-four hour specimens. An initial period of ten days, during which the dose of insulin was adjusted at 22 units at breakfast, 8 units at lunch, 16 units at dinner and 10 units at 4 a. m., was followed by the test period, in which only minor adjustments were made in the amount of insulin injected. These changes were limited to the injection given at 4 a. m. On the tenth day this dose was reduced to 5 units, and it was increased to 7 units on the fifteenth day. No further adjustments were made in the dose of insulin during the remaining portion of the study. The time of observation was divided into four periods, during which the only factor altered was the diet. Throughout all periods the total number of calories and the amount of protein remained constant. The carbohydrate and fat were apportioned as follows: first period (eighteen days), 200 Gm. of carbohydrate and 120 Gm. of fat; second period (nineteen days), 300 Gm. of carbohydrate and 75 Gm. of fat; third period (ten days), 100 Gm. of carbohydrate and 164 Gm. of fat, and fourth period (seven days), 200 Gm. of carbohydrate and 120 Gm. of fat (chart 3).

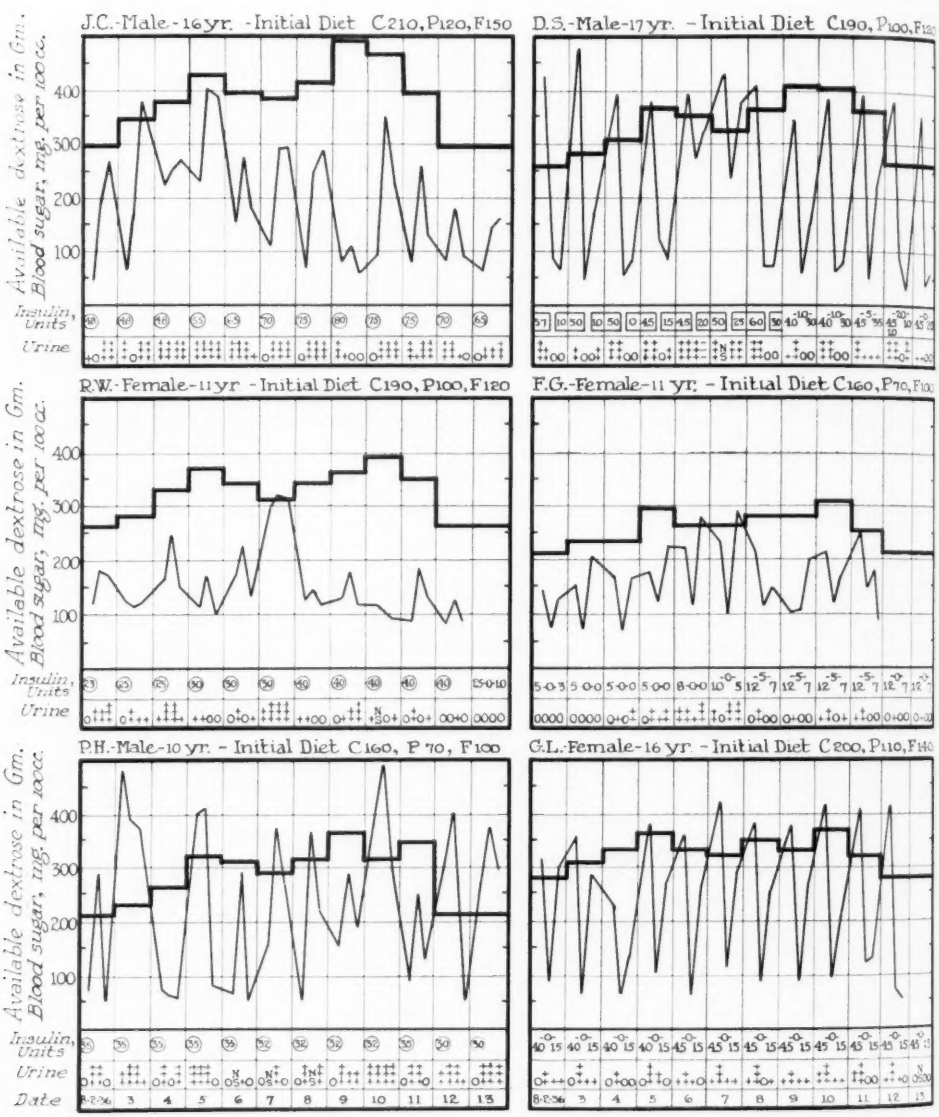


Chart 2.—Curves showing the varying responses to an unrestricted dietary intake. On the first and the last two days each child was limited to his regularly prescribed diet. The heavy lines indicate the available dextrose in the diet in grams (100 per cent of the carbohydrate + 10 per cent of the fat + 58 per cent of the protein). The light lines indicate the values for the blood sugar. The ordinate is for grams of dietary dextrose, or milligrams of blood sugar per hundred cubic centimeters. The units of regular insulin are indicated by plain numerals, the units of protamine insulin by numerals enclosed in a circle and the units of crystalline insulin by numerals enclosed in a rectangle.

First period (eighteen days; diet, 200 Gm. of carbohydrate, 100 Gm. of protein and 120 Gm. of fat): Except in two determinations, the values for blood sugar were all below 200 mg. per hundred cubic centimeters. The daily excretion of sugar was 12.3 and 22.5 Gm., respectively, on two occasions. Otherwise the excretion of sugar was never more than 5.4 Gm., and on five days no sugar was detected in the twenty-four hour specimen. In only eight of sixty-eight qualitative determinations for urinary sugar was there more than a green reduction of Benedict's solution.

Second period (nineteen days; diet, 300 Gm. of carbohydrate, 100 Gm. of protein and 75 Gm. of fat): The trend of the blood sugar curve was distinctly upward in this period and became more marked in the latter portion. Only on the first, third and fourth days were all the values below 200 mg. per hundred cubic centimeters. Nineteen of seventy-two qualitative examinations of the urine

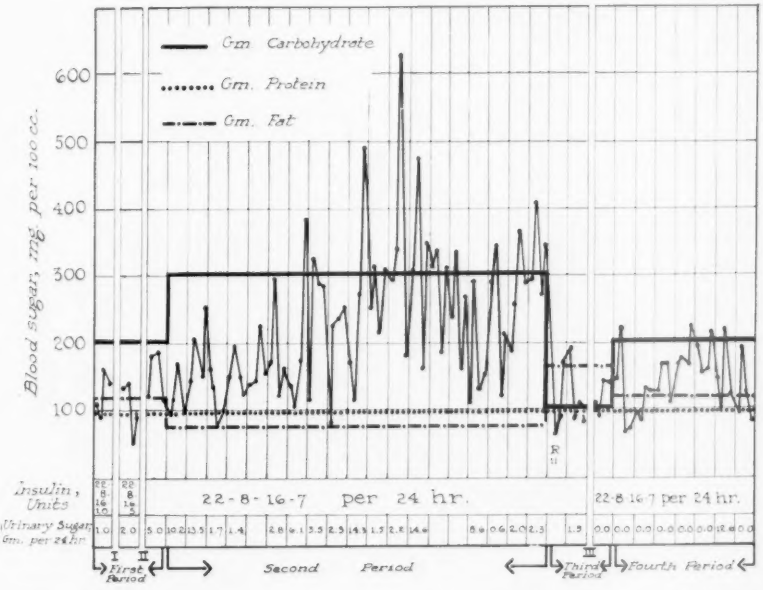


Chart 3.—Curves showing the variations in the blood sugar level and the urinary excretion of sugar in relation to changes in the diet. The first period lasted eighteen days; *I* indicates an interval of ten days and *II* an interval of five days. The second period lasted nineteen days. The third period lasted ten days; *III* indicates an interval of seven days. The fourth period lasted seven days. The roman numerals indicate intervals for which the data are omitted from the chart but for which they are essentially similar to those of the portions of periods shown.

for sugar showed a reaction of 2 plus or more. The daily quantitative excretion of sugar, however, was never in proportion to the increased intake of carbohydrate, nor was the excretion on any day as high as that on the peak day of the first period.

Third period (ten days; diet, 100 Gm. of carbohydrate, 100 Gm. of protein and 164 Gm. of fat): None of the values for blood sugar was as high as 200 mg. per hundred cubic centimeters, and except in four isolated determinations

the value did not deviate markedly from 100 mg. Only one of forty qualitative tests for urinary sugar revealed more than a green reduction of Benedict's solution, and on only two days was sufficient sugar excreted to be detected by quantitative test. On these two days the amount of sugar excreted was 1.5 and 4 Gm., respectively.

Fourth period (seven days; diet, 200 Gm. of carbohydrates, 100 Gm. of protein and 120 Gm. of fat): This was a repetition of the conditions of the first period, and the results were similar. The range of the values for blood sugar was higher than in the third period, but not markedly so. Only one qualitative Benedict test gave a reaction of more than 1 plus, and on only one day was there enough sugar excreted to be determined quantitatively.

Examination of the results of these observations as shown in chart 3 will reveal that there were no essential differences in the sugar content of the blood or the urine with diets containing 100 Gm. of carbohydrate and 164 Gm. of fat, in contrast to diets containing 200 Gm. of carbohydrate and 120 Gm. of fat, when the amount of insulin injected each day remained unchanged. When the carbohydrate was increased to 300 Gm. and the fat reduced to 75 Gm. the level of the blood sugar and that of the urinary sugar were higher. It should be noted, however, that the excretion of sugar was at no time in proportion to the increase of ingested carbohydrate, and the amount of insulin which would have been required to restore the glycemic equilibrium probably would not have been great. These observations do not contribute to the arguments for or against high or low carbohydrate feeding. On the contrary, they are simply evidence of the variable qualitative changes of the diet which were possible in the case of one diabetic child who was receiving a constant amount of insulin. The factors involved in the construction of the optimal diet for diabetic children include the total number of calories, the protein content, the ketogenic-antiketogenic ratio, the growth and developmental response of the child and the child's satisfaction with the diet. Recently Joslin[17] stated that a greater latitude in the diet may be permitted with protamine than with regular insulin and that the carbohydrate content may be varied from 10 to 20 per cent in either direction. On the basis of our experience we are inclined to doubt that there is any essential difference in the effect of either form of insulin in this respect and to believe that the important factor is the initial establishment of glycemic equilibrium. This, of course, can be secured with fewer injections of protamine insulin or with the combined use of protamine and regular insulin than with regular insulin alone.[18] In this study, the child

17. Joslin, E. P., and others: Protamine Insulin, New England J. Med. **214**: 1079-1085, 1936.

18. Nelson, W. E., and Dummer, Clyde: Clinical Experience with Protamine and Crystalline Insulin in the Treatment of Diabetes Mellitus in Children, J. Pediat. **10**:446-455, 1937.

expressed a distinct preference for the diet containing 200 Gm. of carbohydrate, 100 Gm. of protein and 120 Gm. of fat, and he cared least for the one consisting of 300 Gm. of carbohydrate, 100 Gm. of protein and 75 Gm. of fat.

The evidence presented should not be interpreted as an argument for the use of free or unrestricted diets in the treatment of diabetes in children, but it adds further support to the theory that a more normal type of diet may be used. Diets limited only in the carbohydrate content[19] appear to be satisfactory when the supervision is detailed. There are, however, sound arguments for the employment of measured diets. We are not impressed with the need for undernutrition, nor do we understand the logic of those who would keep the child arbitrarily at 10 per cent under his "normal weight." We do believe, however, that there are reasons for avoiding overweight if possible. The control of the child's growth curve would thus constitute sufficient reason for the institution of a measured diet. In addition, there are other arguments, such as insurance of a balanced intake, instruction of the child by experience with the content of an adequate diet, reasonable distribution of the diet throughout the day and the psychologic effect of aiding in training the child in self-discipline. The last factor is certainly not unimportant in the treatment of diabetic children, although it is effective only so long as the child is given an ample diet. Diabetic children cannot be expected to adhere to inadequate diets.

## SUMMARY

Data are presented which indicate that there is a fairly wide range within which, without losing tolerance as measured by the insulin required, the dietary allowance of diabetic children may be varied. This observation should not be interpreted as evidence in favor of any particular arrangement of the diet with respect to the carbohydrate and the fat content. It argues rather for adequate feeding by the employment of diets which not only may be planned satisfactorily and readily by the family of the diabetic child but may be consumed by the entire family. The following factors appear to be of sufficient importance to justify the continued use of measured diets for diabetic children: control of the child's growth, insurance of a balanced dietary intake, instruction of the child by experience with the content of an adequate diet, proportionate distribution of the diet in the various meals and the psychologic effect of aiding in training the child in self-discipline.

19. Lawrence,[13a] Butler.[13b]

# ACUTE ENCEPHALOMYELITIS FOLLOWING GERMAN MEASLES

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Complications in the central nervous system following vaccination and the acute febrile diseases of childhood have become clinically prominent during the past twenty years. The most common neural complication of the acute exanthemas, infectious parotitis, antirabic and other vaccinations and influenza has been disseminated encephalomyelitis.

Least common have been the nervous disorders following German measles. Prior to the severe and widespread epidemic of rubella in 1935, the medical literature contained but two clinical reports (Bénard[1] and Brock[2]) describing this complication. Because of the relatively infrequent appearance of neural complications following rubella, this exanthem was considered relatively benign. While some observers were aware of no severe complications, believing the course to be mild and favorable, others referred to any complication as a coincidence.

During the outbreak of the disease in 1935 there was a sudden and marked increase in the incidence of encephalomyelitis complicating rubella. From scattered areas eight cases were reported (Skinner,[3] Briggs,[4] Merritt and Koskoff[5] and Baumgartner[6]), including one fatality.[4] These obviously did not represent the total number of cases, for Briggs noted that in addition to his two reported cases, three others were known to him but not recorded. If the number of reported cases is an indication of the true percentage, it would appear that the outbreak of German measles in 1935 was particularly characterized by an increase in the incidence of involvement of the central nervous system. In view

From the Neurological Division of the Beth Israel Hospital and the Neuropathological Laboratory of the Montefiore Hospital for Chronic Diseases.

1. Bénard, R.: Bull. et mém. Soc. méd. d. hôp. de Paris **45**:1443, 1921.
2. Brock, J. H. E.: Lancet **2**:1190 (Dec. 7) 1929.
3. Skinner, H. O.: Encephalitis Complicating German Measles, J. A. M. A. **105**:24 (July 6) 1935.
4. Briggs, J. F.: J. Pediat. **7**:609, 1935.
5. Merritt, H. H., and Koskoff, Y. D.: Am. J. M. Sc. **191**:690, 1936.
6. Baumgartner, E. A.: New York State J. Med. **36**:907 (June 15) 1936.

of this, we wish to report six additional cases of encephalomyelitis following rubella, three of which were fatal. These reports are the first to include complete neuropathologic study.

## REPORT OF CASES

CASE 1.—L. B., a man aged 22, an upholsterer, had measles at the age of 11 years and diphtheria and varicella at 12. On May 26, 1935, the face, the abdomen and the back were covered with a pinkish rash, consisting of round and irregular macules which varied in size from that of a pinhead to that of a bean; these were more pronounced on the face, the upper parts of the thighs and the sacro-iliac regions. The temperature was normal. The posterior cervical glands were enlarged but neither painful nor tender. The remainder of the physical findings were negative. Because of the short prodromal stage, the character and distribution of the rash, the cervical adenopathy and the absence of either catarrhal symptoms or Koplik spots, a diagnosis of German measles was made. At the time there was a marked increase in the local incidence of the exanthem. Two days later the eruption had completely disappeared. The only complaint then was itching of the hands and the fingers. Feeling perfectly well, the patient insisted on getting out of bed.

On May 30 he was found moaning and restlessly throwing himself about in bed. He cooperated and answered questions, stating that he felt queer and that his head was heavy but that he suffered no pain. There was no fever or evidence of meningeal irritation; the reflexes were normal. On May 31, when the patient reached for a glass of water his hands shook vigorously. A generalized convulsion followed, with biting of the tongue and frothing at the mouth. In a few minutes the convulsion subsided, and deep coma followed.

*Neurologic Examination.*—On admission to the hospital the patient was comatose. Examination disclosed a slight nuchal spasm, a positive Kernig sign, generalized rigidity with the upper extremities in a semiflexed position and movements of flexion and extension in the extremities, including dorsal extension of the right great toe. The deep reflexes were hyperactive, with a tendency to clonus; there was a Babinski sign bilaterally, more pronounced on the left, and the abdominal and cremasteric reflexes were absent. The fundi were normal and the pupils mydriatic. The corneal reflex was absent. Horizontal nystagmus was noted, as well as conjugate deviation of the eyes to the right. A sensory status could not be determined. The rest of the examination gave negative results. The temperature was 104 F., the pulse rate 120, the respiratory rate 30 and the blood pressure 120 systolic and 80 diastolic.

*Course.*—The patient's temperature continued to rise. Incontinence, difficulty in swallowing and paroxysms of respiratory difficulty appeared. There was a terminal rise of temperature to 108 F., of the pulse rate to 140 and of the respiratory rate to 50. The patient died on June 1, 1935, with respiratory failure.

*Laboratory Data.*—The urine, except for a trace of albumin, was normal. The examination of the blood revealed 5,240,000 red blood cells, 21,000 white blood cells, 88 per cent polymorphonuclear leukocytes and 12 per cent lymphocytes. Culture and chemical analysis of the blood gave negative results. The spinal fluid was clear, had a pressure of 40 mm. and contained 54 cells, of which 56 per cent were lymphocytes; there was no evidence of block. The total protein content was 78 mg., and the chloride content, 520 mg. per hundred cubic centimeters. No organisms were found on smear or culture. The colloidal gold test and the

Wassermann test of the blood and of the spinal fluid gave negative results. A lumbar tap on June 1, 1935, disclosed 115 cells, with 52 per cent lymphocytes.

*Postmortem Examination.*—Examination of the various organs disclosed severe hemorrhage in the lung, irregular stasis in the kidney, the liver and the spleen, and severe fatty changes in the liver.

Nervous System: Gross examination showed the vessels of the cerebral hemispheres and those of the white matter, the neostriatum, the outer fibers of the left corpus callosum, the thalamic nuclei, the white matter of the occipital lobes, the

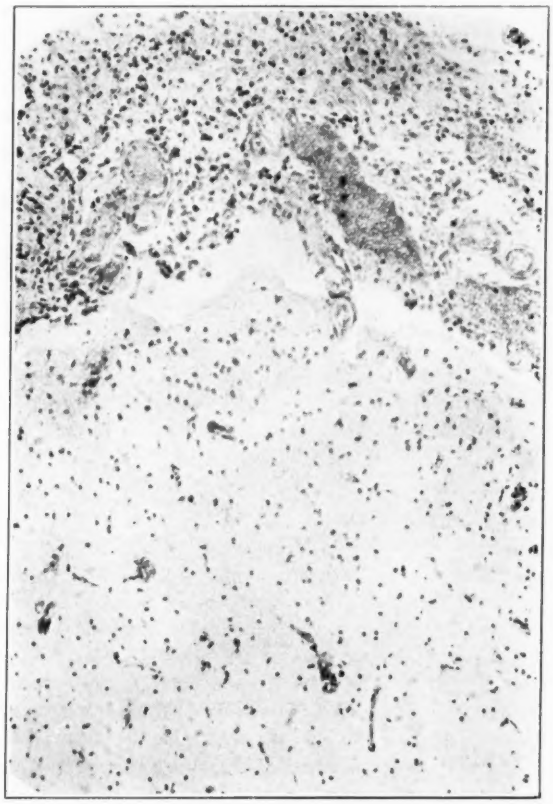

Fig. 1.—Thickened meninges, infiltrated by red blood cells, lymphocytes and arachnoidal cells. Proliferation is evident in the cortical capillaries. Cresyl violet stain; × 50.

pons and the medulla oblongata to be engorged. Sections from the various cortical convolutions, the basal ganglia, the diencephalon, the substantia nigra, the cerebellum, the medulla oblongata and the upper part of the cervical portion of the cord were embedded in a preparation of parlodion.

For microscopic examination the embedded sections were stained with a preparation for demonstrating myelin sheaths and with cresyl violet. Sections from other areas were frozen and stained by the Spielmeyer, Holzer and Bielschowsky methods and with sudan III.

The cortical sections stained with cresyl violet disclosed slightly thickened meninges infiltrated with red blood cells, proliferated arachnoidal cells and a few lymphocytes (fig. 1). This condition was most extensive in the meninges of the

temporal region. The cortical vessels in the upper layers were proliferated, and their walls were thickened (fig. 1). The cyto-architecture was normal. The nerve cells of the various cortical areas stained poorly and showed chromatolysis, severe changes, satellitosis and neuronophagia; some appeared as shadow cells (fig. 2). Perivascular infiltrations consisting of microglia cells, endothelial cells, lymphocytes and deposits of pigment were noted in the cortex and in the white matter (fig. 3). Frozen sections of the cortex in the myelin sheath preparation disclosed slight breaking down of the myelin and axis-cylinders; this was best seen near

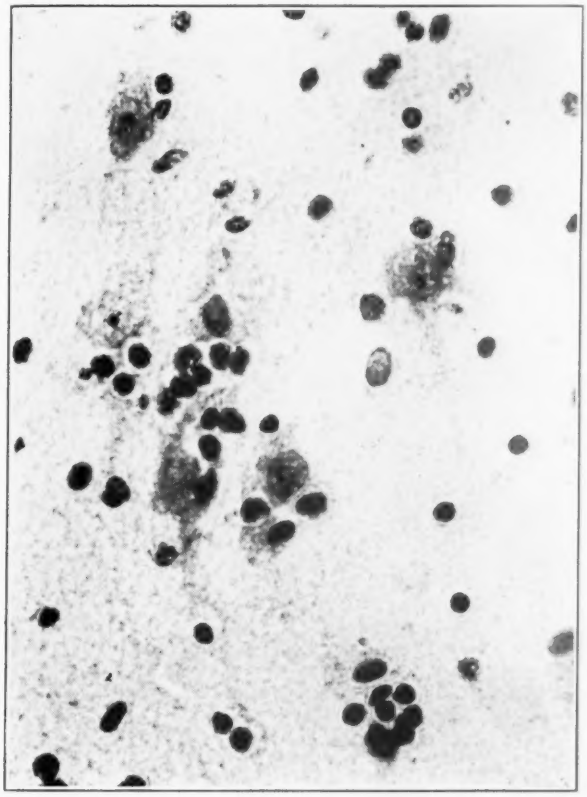

Fig. 2.—Severe changes in the cells, neuronophagia, and chromatolysis of nerve cells. Cresyl violet stain; × 400.

the perivascular spaces. In the sudan III preparation fatty deposits were not found, and the few layers of cells consisted mostly of lymphocytes. The sections passing through the basal ganglia, the thalamus and the substantia nigra showed no outstanding pathologic changes.

In sections of the midbrain and the pons, areas of demyelinization were not observed in the myelin sheath preparation. The aqueductal region was free from an inflammatory process. The nerve cells of the nucleus of the fourth nerve, however, were markedly vacuolated (fig. 4). The other nerve cells of the tegmentum and the pons appeared normal. In sections through the fourth ventricle there was

vacuolation of the nerve cells of the nucleus of the seventh nerve similar to that in the third nucleus of the nerve. In the region of the brachium pontis and the superior cerebellar peduncle there were numerous perivascular infiltrations; these consisted of collections of lymphocytes, plasma, endothelial and microglia cells and pigment granules (figs. 5 and 6). A few of the nerve fibers near the perivascular spaces showed slight disintegration of myelin and axis-cylinders. Sections of the medulla oblongata and the cerebellum revealed perivascular infiltrations in

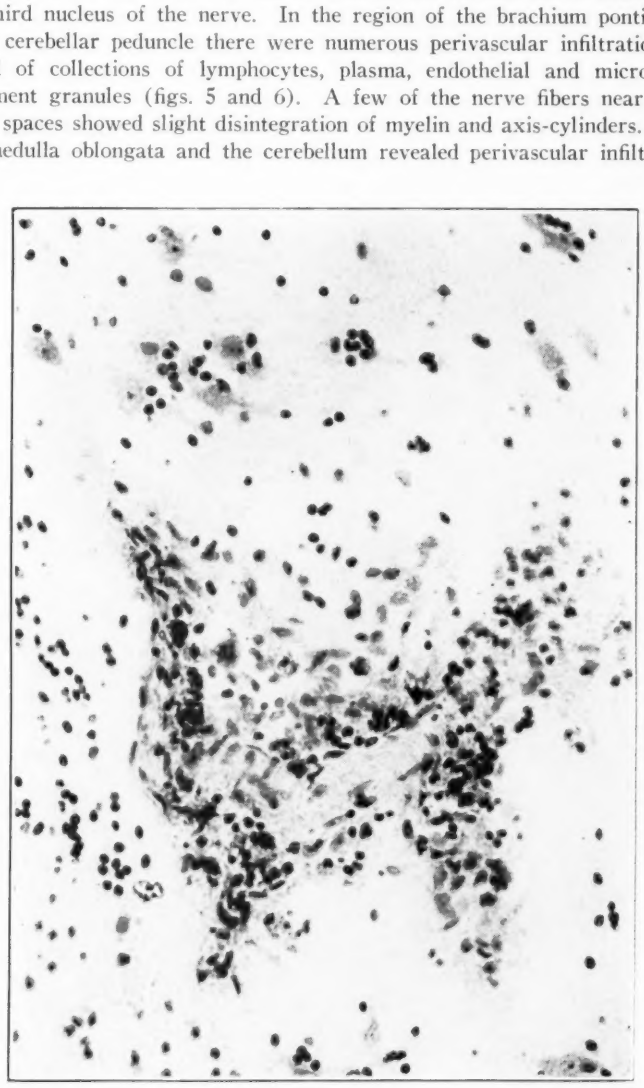

Fig. 3.—Perivascular infiltrations, consisting of lymphocytes, microglia cells and endothelial cells. Cresyl violet stain; × 200.

the white matter and the cortex of the cerebellum. The ganglion cells of the dentate nucleus and the Purkinje cells of the cerebellum stained poorly. In sections through the crossing of the pyramids some of the nerve cells of the nucleus of the eleventh nerve stained poorly and showed central chromatolysis and vacuolation. Perivascular infiltrations were noted in the nucleus cuneatus.

*Comment.*—Clinically this patient presented a typical picture of meningo-encephalomyelitis. Histopathologically the process was diffuse

and was characterized by a slight meningeal reaction and perivascular infiltrations within the white and the gray matter of the various cortical convolutions, the brachium pontis, the superior cerebellar peduncle, the cerebellum and the medulla oblongata. Breaking down of myelin and axis-cylinders, insufficient in degree, was noted near some of the perivascular spaces. Of interest was the vacuolation of the nerve cells of

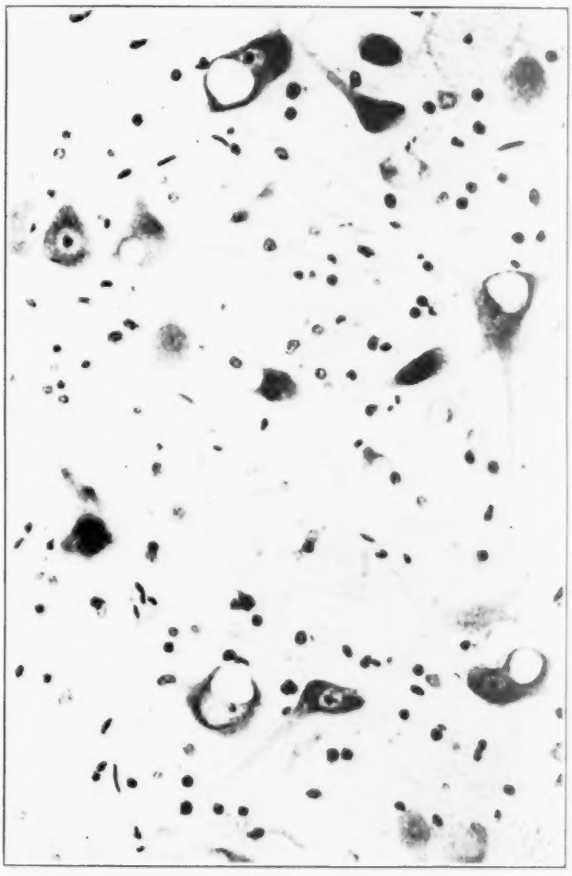

Fig. 4.—Vacuolation of the nerve cells of the nucleus of the fourth nerve. Cresyl violet stain; × 200.

the nuclei of the third, fourth and seventh nerve. This process probably was not the result of the meningo-encephalomyelitis. Vacuolation of nerve cells of the nuclei of the cranial nerves like that in this instance is seen in bulbar paralysis, high fever, exhaustion and intoxication.

Case 2.—A generalized eruption identified as German measles developed in N. W., a woman aged 23, on May 2, 1935. Shortly before this her son had suffered from the same disease and recovered completely without complications. On May 4,

as the rash subsided, there appeared pain at the back of the patient's neck and on the bridge of her nose. Nausea and vomiting were present. On May 10 there developed a slight stiffness of the neck, and there was difficulty in swallowing. The temperature and the blood count were normal. Lumbar puncture revealed

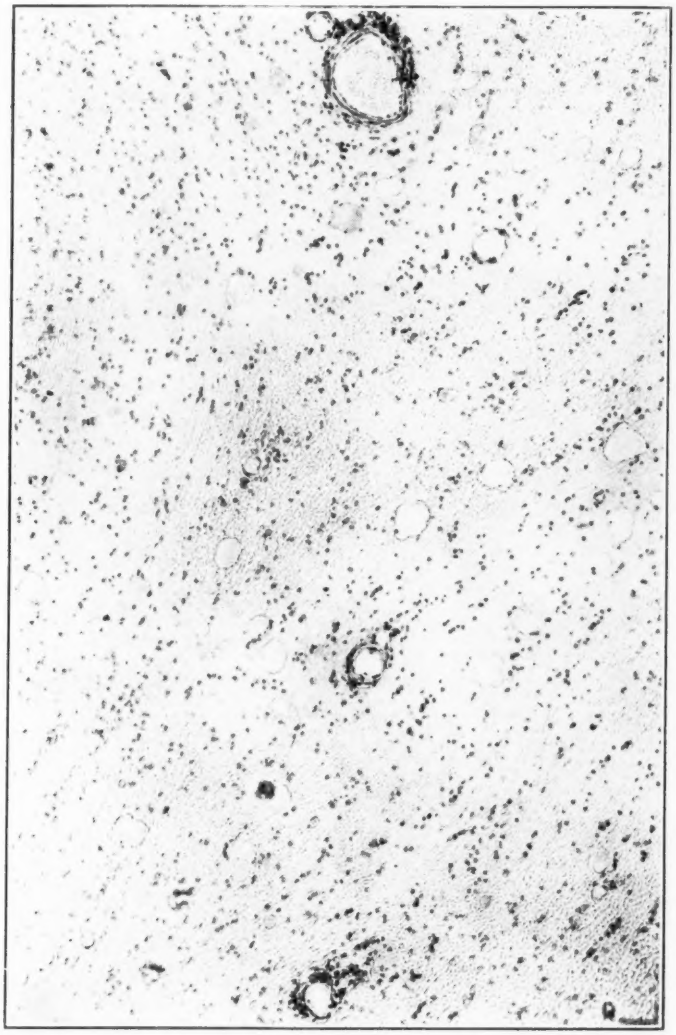

Fig. 5.—Perivascular infiltrations from the superior cerebellar peduncle. Cresyl violet stain; × 80.

clear fluid with a pressure of 90 mm., 4 cells (lymphocytes) and normal sugar, globulin and total protein contents. Chemical analysis of the blood gave normal results, except for a dextrose content of 176 mg. per hundred cubic centimeters.

*Neurologic Examination.*—On May 12 the patient was lethargic but cooperative. There were slight rigidity of the neck and general weakness, especially in the

lower extremities; the deep reflexes and abdominal reflexes were absent, and there were no pyramidal tract signs. There were hypalgesia, hypothermesthesia and loss of vibratory and position sense in the upper extremities up to the shoulders. Position sense was retained in the lower extremities, but there was a loss of vibratory sense. The fundi were normal. A jerky horizontal nystagmus was in evidence, and there was a peripheral weakness of the right side of the face. The palatal movements were poor, the gag reflex was diminished and protrusion of the tongue was poor. Two days later a peripheral paralysis of the left side of the face was noted. The bulbar signs became more pronounced and were accompanied

Fig. 6.—Perivascular infiltration in the superior cerebellar peduncle, consisting of lymphocytes, microglia cells and pigment granules. Cresyl violet stain; × 200.

by difficulty in breathing and cyanosis. The patient died on May 17, 1935. Autopsy was not performed.

*Comment.*—The meningeal signs, the radicular pains, the sensory level in the cervical region, the bilateral peripheral facial paralysis and the partial involvement of the nuclei of other bulbar nerves pointed to a diagnosis of meningo-encephalomyeloradiculitis.

Case 3.—B. W., a girl aged 13, manifested typical German measles on May 3, 1935. She had had measles, chickenpox and whooping cough at the age of 5 years.

On May 6, 1935, the child rushed from bed and began to vomit. Her face became expressionless and immobile, and shortly thereafter she began to scream madly and scratch her head and body furiously. For a period of two days she was completely disoriented. A lumbar puncture on May 8 disclosed the presence of 68 lymphocytes. The following morning the patient was normal for a short period.

The general physical examination gave negative results, except for a macular hemorrhagic rash on the right arm and excoriations due to scratching on the left shoulder. The patient was admitted to the Montefiore Hospital on May 8, 1935, in a semistuporous condition. She moved violently in her bed and cried continuously for her mother. She was totally disoriented and refused to allow examination. Five hours later she was alert, lay quietly in bed, answered questions relevantly and was fairly cooperative.

*Neurologic Examination.*—There were slight bilateral ataxia, dysdiadokokinesis and generalized hyperreflexia, with patellar and ankle clonus on the right side; the lower abdominal reflexes were absent and Babinski and Oppenheim signs were present on the right side. The motor power was normal. A careful determination of sensory status could not be made. The right pupil was larger than the left and reacted to all stimuli. The patient was still disoriented in all spheres, although she recognized the nurse.

*Course.*—Forced spinal drainage was performed on May 8; 60 cc. of spinal fluid was recovered, and 1,000 cc. of 0.4 per cent saline solution was administered. The patient improved considerably, and on the next day mental symptoms and neurologic signs, except for a slight ataxia, disappeared. On May 11 there was a return of the cerebellar signs, and of the Babinski sign on the right; the speech became slightly impaired. A second spinal drainage was done, at which time the patient received 2,000 cc. of 0.4 per cent saline solution intravenously. The patient was completely recovered by May 15, 1935.

*Laboratory Data.*—The spinal fluid looked like ground glass and contained 68 lymphocytes per cubic millimeter; the Pandy reaction was negative; the reaction to the Benedict test was positive and that to the tryptophan test negative. Subsequent spinal drainages, on May 9 and on May 14, disclosed 36 and 30 cells per cubic millimeter, respectively.

*Comment.*—The mental picture and the cerebellar and the pyramidal tract signs pointed toward dissemination of the lesion. In this case, the treatment by spinal drainage and the rapid recovery are of interest. At present this form of treatment is probably the best in all types of encephalomyelitis following the exanthems.

CASE 4.—J. C., a boy aged 7 years, was admitted to the St. John's Long Island City Hospital, Long Island City, N. Y. The patient had had measles in 1934. He had a fall in May 1935, but there was no bleeding or sign of concussion. He contracted German measles in June 1935 and shortly thereafter became drowsy and apathetic.

*Neurologic Examination.*—The patient was somnolent and apathetic; tremor was noticeable in the right hand and there was ataxia of the upper and the lower extremities. Occasional athetoid movements of the hands were present, as well as hyperkinesis. The reflexes were normal. There was paralysis of the right internal rectus muscle and of the left lower facial muscles. A diagnosis of encephalitis

following German measles was considered. There was gradual improvement, and the patient was completely recovered when he was seen two months later.

*Laboratory Data.*—The spinal fluid was clear, came under normal pressure and contained 1 cell per cubic millimeter. There was no albumin. All the other laboratory tests gave negative results, except for a trace of albumin in the urine.

CASE 5.—M. M., a girl aged 8 years, was admitted to the Lincoln Hospital, New York. The past history was irrelevant. On June 6, 1935, a rash had developed on the face, the chest and the arms. This was accompanied with slight fever and vomiting. A diagnosis of German measles was considered.

*Neurologic Examination.*—A few days later examination disclosed a Brudzinski sign, marked tetanic contractions of all the muscles, slightly increased biceps and the left patella reflexes and a positive Babinski toe sign. Status epilepticus set in, and the patient died. During the illness the patient had a temperature of 104 F., a pulse rate of 160 and a respiratory rate of 30. A diagnosis of acute encephalitis following German measles was made.

*Laboratory Data.*—A white blood count revealed 19,400 cells, with 80 per cent polymorphonuclear leukocytes. The urine, except for a 2 plus reaction for acetone, was normal. The spinal fluid was clear, came under normal pressure, contained 8 cells per cubic millimeter and gave positive results for albumin and globulin.

CASE 6.—E. C., a boy aged 19, was seen at home by a representative of the department of health. The family and past histories were irrelevant. The patient had had German measles for five days when there developed headache, vomiting and drowsiness.

*Neurologic Examination.*—There were stiffness of the neck and a slight Kernig sign; the deep reflexes of the upper and the lower extremities were diminished, and the reaction of the pupils to light was sluggish. The patient made a complete recovery.

*Laboratory Data.*—A lumbar puncture and other laboratory tests gave negative results.

## COMMENT

The neural complications of the virus diseases of childhood are so striking that the record of their appearance following measles in 1790 (Lucas [7]) occasions little surprise. The case of neuropathologic changes complicating measles (morbilli) reported in 1887 by Barlow and Penrose [8] and later by Ferraro and Scheffer [9] and others differed little from those of encephalomyelitis following other exanthemas, vaccinations, influenza, and other virus diseases. The pathologic process in cases of disseminated encephalomyelitis usually consists of discrete areas of demyelinization around the blood vessels, especially the small veins, with destruction of myelin, axis-cylinders and glial tissue. The perivascular spaces are usually filled with microglia cells, lymphocytes and plasma and endothelial cells. In some cases only microglia cells have been reported, while in others these were found in combination with

7. Lucas, J.: London M. J. **11**:325, 1790.

8. Barlow, T., and Penrose, F. G.: Med.-Chir. Tr. London **70**:77, 1887.

9. Ferraro, A., and Scheffer, I. H.: Encephalitis and Encephalomyelitis in Measles, Arch. Neurol. & Psychiat. **25**:748 (April) 1931.

inflammatory cells. In addition to the characteristic findings just cited, vascular endothelial swellings, thrombi, perivascular hemorrhages and local lipoid degenerative changes have been described. Absence of perivascular demyelinization was described in a few instances of measles.

Although an extensive literature concerning the clinical, laboratory and pathologic manifestations of the various encephalomyelitides has been accumulated, little is known of encephalomyelitis following German measles. The neuropathologic lesions have never been carefully studied. Briggs [4] was the first to describe neurohistopathologic changes, and he referred to these as "perivascular infiltration of lymphocytes and polymorphonuclear leukocytes at many points with occasional perivascular red blood cells." In our first case the histopathologic picture consisted essentially of a slight meningitis and perivascular infiltrations of lymphocytes and plasma, endothelial and microglia cells. These perivascular infiltrates were found in the gray and the white matter of the cortical convolutions, the brachium pontis, the superior cerebellar peduncle, the dentate nuclei, the cerebellum and the medulla oblongata. The nerve cells in the vicinity of these perivascular infiltrates showed changes similar to those seen in acute encephalitis. Extensive areas of perivascular demyelinization, as noted in some cases of encephalomyelitis following measles (morbilli) or some other virus disease, were not observed in our case. Breaking down of myelin sheaths and axis-cylinders in the white matter with perivascular infiltrations were found to a minimal degree. It is to be emphasized that the histopathologic picture in some cases of encephalitis following measles was the same as that in our case. Future studies of neural sequelae of German measles may reveal in some instances marked perivascular areas of demyelinization, as seen in some of the disseminated encephalomyelitides, while in other instances the picture may resemble that of encephalitis without extensive perivascular demyelinization.

A clinical review of the 13 cases of German measles complicated by encephalomyelitis during the epidemic in 1935 and of those reported by us deserves consideration.

## ETIOLOGY

*Prevalence.*—In 1921 Bénard [1] described 13 cases of German measles with complications in the central nervous system out of a total of 291 cases. Since then no major outbreak has been recorded. The sudden reappearance of encephalomyelitis following rubella in 1935 tended to confirm Greenfield's [10] observation that there is a periodicity in the occurrence of this complication following virus diseases. Scattered communities were represented in the reported cases in New York.

10. Greenfield, J. G.: Brain **52**:171, 1929.

Connecticut, Massachusetts and Minnesota. There did not appear to be a distinct seasonal occurrence except that the complication was noted during major outbreaks of the exanthem.

In the 13 cases occurring during the 1935 outbreak and our 6 cases, 8 patients were past puberty, their ages ranging from 14 to 43. This is an unusual feature when one considers the usual age distribution of rubella. A similar observation of the increased susceptibility of persons above the usual age for distribution of a particular virus disease to contract encephalomyelitis was noted in Holland (Rivers [11]). Male subjects were affected in 11 of the 19 cases.

*Causative Agent.*—The causative agent producing the postvirus neural complications, despite extensive investigations, still remains uncertain. There are several suggested explanations of the encephalomyelitis:

1. Local Virus Effect: The disorder is due to direct action of the same virus (or its toxins) which causes the exanthem. Viruses have occasionally been demonstrated in the brain in fatal cases. The injection of the virus into the brain of a susceptible animal has also been reported to cause encephalomyelitis. Turnbull and McIntosh [12] expressed the belief that reinoculation of the emulsified brain of an infected animal may further disseminate the disease. Rivers,[11] however, demonstrated the virus in the tissues and the brains of vaccinated animals that showed no evidence of encephalomyelitis. After intracerebral inoculation others failed to note clinical or pathologic changes resembling encephalitis (Hurst and Fairbrother [13]). Encephalomyelitis with perivascular demyelinization has been produced in monkeys by intramuscular injections of aqueous emulsions and alcohol-ether extracts of normal rabbit brains when previous existence of an infectious agent could not be demonstrated. The disease could not, however, be reproduced by direct intracerebral injection (Rivers and Schwentker [14]). Hurst [15] expressed the opinion that so far there is not sufficient evidence that the encephalomyelitides are due to the action of a filtrable virus.

2. Activation of a Latent Virus: A local neural virus is activated by the exanthem or vaccination. As early as 1790 Lucas [7] described a case of transient paraplegia following measles. Smallpox developed later, and the paraplegia recurred. This manifestation suggested the activation of a latent virus by various invaders. Greenfield [10] suggested that the resident neural virus spreads in epidemic waves and causes

11. Rivers, T. M.: Viruses, J. A. M. A. **92**:1147 (April 6) 1929.
12. Turnbull, H. M., and McIntosh, J.: Brit. J. Exper. Path. **7**:181, 1926.
13. Hurst, E. W., and Fairbrother, R. W.: J. Path. & Bact. **33**:463, 1930.
14. Rivers, T. M., and Schwentker, F. F.: J. Exper. Med. **61**:689, 1935.
15. Hurst, E. W.: Brain **59**:1, 1936.

disease only when stimulated to activity by the exanthem. The variations between the clinical picture following measles and that following German measles may be explained as due to specific disease agents resulting from the action of the virus of a particular exanthem on the resident neural virus.

3. Anaphylactic Reaction: The reaction in the nervous system is allergic, like other reactions caused by the previously mentioned diseases. The infrequent occurrence of the condition could be explained by the variability of constitutional predisposition toward such a state. This, however, could not account for the increasing tendency to periodicity. Further evidence against this theory is the absence of cutaneous, hematologic or other allergic manifestations.

## CLINICAL PICTURE

The course of rubella furnishes no indication of an impending neurologic disorder. The clearing of the rash is followed by a short latent period, of from one to six days.

The onset of neurologic manifestations is rapid and occasionally apoplectiform. Headache, irritability and vertigo or vomiting are usually the first signs to be noted, although convulsions or coma occasionally may be the presenting symptoms.

Owing to the variability and dissemination of the neural lesions, a multiplicity of signs and symptoms are encountered. Even involvement of the peripheral nerves may be noted.

Clinically the initial picture includes pain over the back of the neck, restlessness, irritability and convulsions, which are followed occasionally by deep coma. At times impairment of memory, disorientation (case 3) or mania completes the mental picture. While nuchal spasm, a Kernig sign and the associated manifestations of meningeal involvement are often noted, severe opisthotonos is rarely seen.

The pupils are generally dilated and react sluggishly to light. The fundi are normal or show slight blurring of the margins of the disk. Strabismus with diplopia, nystagmus, conjugate deviation, photophobia and defects in speech are noted infrequently. Peripheral facial palsy has been encountered (case 2).

While there is great variation in the extent of the deep reflexes, the superficial reflexes are constantly diminished, the abdominal reflexes being absent in almost every case. Exaggerated reflexes (case 3), the Babinski sign and allied signs (cases 3 and 5) and ankle clonus have been reported. An occasional tendency is that toward semiflexion of the forearms at the elbows. Isolated instances of paraplegia, disturbances in sensory perception (case 2), cerebellar signs (cases 3 and 4), extrapyramidal signs (case 4) and urinary retention or incontinence

(case 1) may also be observed. Bulbar symptoms, such as dysarthria, dyspnea and dysphagia, appear ominously in the cases of more severe involvement.

The constitutional reactions are not prominent at the outset, the temperature being either normal or only slightly elevated. However, a rapid rise in temperature to between 106 and 108 F. may take place preceding death. The pulse bears a direct relationship to the elevation of temperature. There is moderate leukocytosis, the count ranging between 10,000 and 18,000, and the number of polymorphonuclears is increased.

The spinal fluid is clear in every instance. With rare exceptions, the pressure is normal or slightly elevated. The globulin content also may be within normal limits. Quantitatively, estimations give results of protein varying between 37 and 82 mg.; those of dextrose, between 65 and 82 mg., and those of chlorides, between 520 and 714 mg., per hundred cubic centimeters. The total cell content ranges between normal and 100 per cubic millimeter and averages 40, with a preponderance of lymphocytes. Cultures, direct smears and serologic studies give negative results.

## PROGNOSIS

Encephalomyelitis complicating rubella is an acute, self-limited disease, which has resulted thus far either in complete recovery without sequelae or in death within a few days. This is in marked contrast to the similar complications of measles (morbilli), 65 per cent of the survivors of which have been reported to suffer residual manifestations. None of our surviving patients showed any residua. Comparative estimates must be guarded, however, in so small a series of cases. A further period of observation is necessary for excluding latent or delayed alterations of the nervous system following rubella, which may subsequently become apparent. Fulminating forms may occur in which death ensues on the first or the second day. Although recovery followed in the case reported by Brock,[2] and although Bénard [1] reported only 1 death in 13 cases, there were 4 additional deaths out of 13 instances of encephalomyelitis following rubella during the 1935 epidemic and 3 in our series.

Obviously, rubella is neither free from severe complications nor foreign to the neurologic syndrome that has become associated with the virus diseases of childhood.

## TREATMENT

There is no specific therapy. In addition to the symptomatic form of treatment, spinal drainage as used in case 3 should be attempted in encephalomyelitis following the exanthems, vaccinations and allied disorders.

## SUMMARY AND CONCLUSIONS

Six cases of German measles complicated by acute encephalomyelitis are reported. The neural signs in all cases gave evidence of widespread dissemination of the lesion.

One case which was observed histopathologically disclosed slight meningitis, disease of the nerve cells and perivascular infiltrations in the gray and the white matter of the cortical convolutions, the brachium pontis, the superior cerebellar peduncle, the dentate nuclei, the cerebellum and the brain stem.

Obviously, rubella is neither free from severe complications nor foreign to the neurologic syndromes associated with the virus diseases of childhood.

In the absence of a specific form of therapy, spinal drainage is advocated.

The report of case 2 was supplied by Dr. E. D. Friedman, that of case 3 by Dr. I. S. Wechsler and those of cases 4, 5 and 6 by Dr. Josephine B. Neal.

# ACUTE APPENDICITIS IN CHILDREN

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This study was made to determine, in general, the mortality from acute appendicitis in children and, in particular, the effect on mortality of recent changes in the treatment of peritonitis and of the prevalent, more conservative attitude toward the management of appendical abscess.

During the fifteen year period between 1921 and 1935, 592 children aged 12 years and less were admitted to the Children's Memorial Hospital with pathologic appendixes. Approximately 95 per cent of the children were assigned to the charity wards, where they were cared for by the regular attending staff. The cases have been divided into three groups, a five year period being covered in each division, and each group has been further divided according to the pathologic picture. In the first classification are the cases of acute inflammation or gangrene of the appendix. (Cases in which the appendix was normal or chronically inflamed are not included.) In the second are cases in which the appendix was perforated. Because of the obvious difficulty in determining at the operation the degree of contamination, the extent of the peritonitis or the virulence of the released organisms, no attempt was made to subdivide this group further. In the third division are all cases of appendical abscess, divided according to whether or not operation was performed.

## ACUTE AND GANGRENOUS APPENDICITIS

Concerning cases of acute and gangrenous appendix little comment is necessary (table 1). The operation is performed under ether or ethylene anesthesia through a muscle-splitting incision. The stump of the appendix is turned in with silk when the inflammation is confined to the appendix and with catgut when the inflammation has extended into the cecum. Because of the likelihood of an infection of the abdominal wall after removal of a completely gangrenous appendix, a small soft drain is frequently placed in the wound to the peritoneum.

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From the department of surgery of the Children's Memorial Hospital, Chicago (other members of the surgical staff: A. H. Montgomery, chief; J. Graham, J. Ireland, J. Mussil, S. Lawton and A. Diggs).

Culture of the reactionary fluid in the abdomen in cases of acute but not gangrenous appendicitis yielded no growth in 26 instances and positive cultures in 23, colon bacilli and streptococci being the predominating organisms.

Three deaths occurred, a mortality of 1 per cent. The first was that of a 10 year old boy who had been acutely ill for three days and on admission had a temperature of 105.8 F. Seventeen days after the removal of an acutely inflamed appendix, death from intestinal obstruction, peritonitis and general sepsis followed. The second was that of a 7 year old boy who had been ill one day and had a temperature on admission of 101 F. Death from peritonitis followed nine days after the removal of a gangrenous appendix. The third was that of a 5 year

TABLE 1.—*Acute and Gangrenous Appendicitis*

| Year | Number of Cases | Deaths | Percentage |
|---|---|---|---|
| 1921-25 | 16 | 0 | 0.0 |
| 1926-30 | 85 | 1 | 1.1 |
| 1931-35 | 196 | 2 | 1.0 |
| Total | 297 | 3 | 1.0 |

TABLE 2.—*Ruptured Appendix Accompanied with Peritonitis*

| Year | Number of Cases | Deaths | Percentage |
|---|---|---|---|
| 1921-25 | 23 | 5 | 21.7 |
| 1926-30 | 60 | 13 | 21.6 |
| 1931-35 | 107 | 13 | 12.1 |
| Total | 190 | 31 | 16.3 |

old boy with a history of thirty hours' illness and temperature on admission of 103.8 F. Death from bronchopneumonia and peritonitis occurred five days after removal of a gangrenous appendix.

In dealing with the hazard of an acute intra-abdominal infection requiring a major surgical operation, it seems from a survey of the voluminous literature that a mortality of 1 per cent is close to the irreducible minimum.

### PERFORATED APPENDIX WITH PERITONITIS

The large number of ruptured appendixes—approximately 40 per cent—can be accounted for by the fact that most of the children had underprivileged parents who believed all stomach ache to be due to something the child had eaten and treated it accordingly.

The decrease in mortality during the past five years—from 21.6 per cent to 12.1 per cent (table 2)— can be accounted for, I believe, by two

essential changes in postoperative management. The first is the employment of continuous gastric and duodenal lavage by the Levine tube, according to the simple and ingenious method popularized by Wangensteen. Prior to the introduction of this method in 1932, gastric lavage was employed, but every physician knows how distressing the repeated introduction of the stomach tube is and how unsatisfactory the procedure is for keeping the stomach empty.

It is now an accepted routine of the resident staff of the Children's Memorial Hospital to insert a small Levine tube through the nose into the stomach and the duodenum of every patient suffering from peritonitis or ileus at the first sign of a collection of fluid in the stomach or the upper part of the bowel, such as vomiting or distention. This procedure is invaluable in the treatment of temporary intestinal obstruction caused by a plastic exudate about intestinal loops. There has not been the anticipated tendency for children to pull out the tube, and the occasional child who does so is easily prevented from repeating the act by restraint on the arms. The tube is left in for from one to three days as required, is then removed for a day or a night and if symptoms of backflow recur is reinserted. Some patients have had the tube in for the major portion of a week. Children are extremely tolerant when their cooperation is properly sought. Children with tubes in their stomachs are allowed to have rather frequent sips of water. This is gratifying to them, improves their morale and does no harm, as the water is promptly siphoned off by the suction tube.

There have been no ill effects from the use of this tube, except possibly in one patient with peritonitis who died eight days after operation and had had the tube in his stomach or duodenum most of that time. Before death bright red blood was aspirated, and at postmortem examination an ulcer was found in the stomach. This may have been caused by the pressure of the tube or by continuous suction on that particular portion of the mucosa of the stomach. By shutting off the tube occasionally for short periods this can be avoided.

Previous to the coming into use of the Levine tube with continuous suction, ileostomy or jejunostomy was necessary in 12 cases to drain the distended bowel; since its adoption no such procedure has been employed.

The second reason for a decreasing mortality, I believe, is the proper and adequate parenteral administration of fluid to the children who are unable to utilize it when given by mouth. During the first five year period, from 1921 to 1925, fluid was given largely by rectum, by means of the Murphy drip. During the second period this method was supplemented by giving small amounts of fluid subcutaneously and intravenously. Since approximately 1930 almost all fluid has been given by vein, some subcutaneously and none by rectum. The ineffectiveness

of administering fluid by rectum is best learned from reading in the old charts the nurses' notes, which monotonously repeat: "Murphy drip started. Patient unable to retain fluid. Drip discontinued. Linen changed." Fluid given by rectum in cases of peritonitis not only is inadequately retained but distends and irritates the bowel, thereby defeating the aim of treatment, viz., rest of the bowel and relief from distention.

Intravenous administration of a 5 per cent solution of dextrose and physiologic solution of sodium chloride, separately or combined, and lactate-Ringer solution have been found most satisfactory. The antecubital vein or the saphena magna on the dorsum of the foot is used, the latter being more satisfactory for the patient and for the nursing staff. Since the stomach is being emptied constantly, the loss of chloride is great, and the supply must be replenished by adequate amounts of solution of sodium chloride. Dextrose is important as a food and as a preventive of acidosis. The average child requiring parenteral administration of fluid receives approximately 1,000 cc. of either physiologic solution of sodium chloride or lactate-Ringer solution as seems indicated, plus 1,000 cc. of 5 per cent solution of dextrose each twenty-four hours. There is no virtue in flooding a patient to the point of generalized edema. The dictum of Frederick A. Coller of Ann Arbor concerning the choice of fluid is an excellent guide: "Supply what the patient needs."

Other essentials of postoperative care, such as adequate sedation of the bowel, application of hot stupes to the abdomen and placing the patient in Fowler's position, have not varied greatly during the past fifteen years. Indications for blood transfusion are constantly being broadened, not only for patients who are acutely ill but for those who are fighting a close battle with infection over a period of weeks.

Quick and gentle surgical operation has become a ritual. When the diagnosis is rather clear, a muscle-splitting incision just inside the anterior superior spine of the ilium is employed as a routine, the theory being that the further laterally one works the less will be the necessity for handling, and thereby contaminating, the loops of small bowel.

The cause of death in 29 of the 31 cases in this group was local or general peritonitis or some of its complications, such as intraperitoneal or extraperitoneal abscess, ileus, sepsis, infection at the wound or terminal bronchopneumonia. One child died of lobar pneumonia on the thirteenth day, and one death followed what appeared clinically to be a cerebral embolus. No postmortem examination was allowed.

Twenty-seven children had a ruptured appendix less than twenty-four hours after the onset of symptoms.

### APPENDICAL ABSCESS

The formation of a walled-off mass about an inflamed or ruptured appendix is nature's successful method of treatment. The third group of cases is made up of those in which generalized peritonitis has been avoided by this process (tables 3 and 4).

The question of prime importance in each case is: How shall the mass be treated? Until the beginning of 1933, at which time a more conservative attitude toward the treatment of appendical abscess was adopted, there were only 10 cases observed in this study in which no operation had been performed. During the last three years covered by this study there were more patients treated nonsurgically than surgically.

TABLE 3.—*Conservatively Treated Appendical Abscess*

| Year | Number of Cases | Deaths | Percentage |
|---|---|---|---|
| 1921-25 | 3 | 0 | 0 |
| 1926-30 | 4 | 0 | 0 |
| 1931-35 | 25 | 0 | 0 |
| Total | 32 | 0 | 0 |

TABLE 4.—*Surgically Treated Appendical Abscess*

| Year | Number of Cases | Deaths | Percentage |
|---|---|---|---|
| 1921-25 | 7 | 0 | 0.0 |
| 1926-30 | 31 | 0 | 0.0 |
| 1931-35 | 35 | 4 | 11.4 |
| Total | 73 | 4 | 5.4 |

In the fifteen year period there were no deaths among 32 patients treated conservatively and 4 deaths among 73 patients operated on, or a surgical mortality of 5.4 per cent.

The statistics for morbidity are no less striking. The average stay in the hospital of 32 patients whose appendical masses were treated conservatively was thirteen days, and there were practically no complications; whereas of the 69 patients who recovered from operation, the average stay in the hospital was thirty-three days, and there were many complications, including fecal fistula in 7 cases, intestinal obstruction in 4, and extensive infection of the abdominal wall, accompanied with chronic draining sinuses, secondary anemia or postoperative hernia in many others. These figures are, of course, colored by the fact that the sicker children with larger abscesses were in the group in which operative procedure was undertaken.

The histories of the 4 children with appendical abscess who died after operation are instructive:

CASE 1.—J., aged 4 years, had been ill for seven days. The temperature was 100.2 F., and the leukocyte count, 30,000. No mass was palpable. On operation

the pockets of the abscess were drained, and a free fecalith was found. The appendix was not removed. Pneumonia followed the operation and death ensued sixteen days later. Postmortem examination was not allowed.

CASE 2.—H., aged 12 years, had been ill for ten days. The temperature was 101.6 F., and the leukocyte count, 18,000. A moderate-sized mass was noted at the midline. On operation the abscess was drained, and the general peritoneal cavity was opened during removal of the appendix. Death from generalized peritonitis followed in twenty-four hours. The diagnosis was confirmed by postmortem examination.

CASE 3.—P., aged 12 years, had been ill for seven days. The temperature was 104 F., and the leukocyte count, 5,500. There was an ill defined mass in the right lower quadrant of the abdomen. On operation the abscess was drained; the appendix was not removed. Death from generalized peritonitis followed in twelve hours. Postmortem examination was not allowed.

CASE 4.—M., aged 12 years, had been ill for four days. The temperature was 102 F., and the leukocyte count, 20,000. A grapefruit-sized mass was noted in the pelvic region at the time of admission. This enlarged somewhat during three days of observation in the hospital. Operation was performed seven days after the onset of the disorder. The abscess was drained; the appendix was not removed. The temperature went up to 106 F., and death from generalized peritonitis occurred in twenty hours.

Consideration of these cases in retrospect would lead to the following conclusions: In the first child fatal pneumonia, which may be classed as postoperative, developed. The second died of peritonitis resulting from the operation. The third was extremely ill at the onset and would have been likely to die, regardless of treatment. The fourth case was the subject of much argument, some physicians advising surgical and others conservative management. The death suggests that judgment was poor. Two and probably three of these children might have lived had they not been operated on.

Looking at the entire picture from the opposite side, in all fairness I must state that some of the 69 patients whose abscesses were operated on might have died had operation not been performed. Controls are impossible, and conclusions can be drawn only from impressions gathered from following the cases from day to day. To see repeatedly spontaneous disappearance in a week or ten days of an appendical mass the size of an orange or a grapefruit is rather convincing of the remarkable saving power of the omentum and the peritoneum.

In determining the proper treatment of an appendical mass, it is essential to picture in each case the pathologic changes occurring. The omentum, as the abdominal life saver, wraps itself about the infected appendix and if the rupture is small and the infection not too virulent walls off the infection. The mass felt in such cases contains little pus and consists largely of an edematous roll of omentum and a heavy plastic exudate. The size of the mass is often not commensurate with the amount of pus present. In the more virulent forms of appendical

abscess the mass consists of a pyogenic membrane enclosing moderate to large quantities of pus. It is difficult to know whether the ruptured appendix is remaining open and continuing to discharge fecal material into the abscess or whether it has been sealed off by inflammatory products. This can be decided only by watching the clinical course. Cases of this group, including those in which there are multiple abscesses, require deliberate judgment for proper management.

The present attitude of the surgical staff toward the handling of the patients may be summarized as follows: A child who enters the hospital with a mass in the abdomen following a history suggestive of preceding appendicitis is put under observation. The duration of the illness, as well as the findings on physical examination and in the laboratory, help us to decide on the proper course of treatment. If the clinical condition is good to fair and if there are no symptoms of intestinal obstruction, the child receives hot stupes to the abdomen and soft foods. No limitation is placed on the intake of fluids. The temperature slowly falls, and the mass, which may vary from a few to 10 cm. in diameter, disappears spontaneously, often in from seven to ten days. If the child is vomiting—a manifestation which suggests temporary intestinal obstruction due to a plastic exudate about a few loops of bowel—a Levine tube is inserted into the duodenum, nothing is allowed by mouth and fluids are given intravenously. Careful and frequent observations are made and recorded. A distended bladder, rather common in sick children, may easily be mistaken for an abscess. If during a period of several days the mass in the abdomen continues to enlarge, the symptoms of intestinal obstruction persist, the temperature rises, the leukocyte count increases and the child becomes clinically worse, the abscess is usually drained. However, it is preferable to avoid surgical intervention during the critical period from the fourth to the seventh day after the onset of symptoms. During this time nature is building up a protective wall about the infection, and to disturb that wall before it is firm is to invite disaster.

A pelvic abscess is treated conservatively for a long time in the hope that peritoneal fixation will occur. If after a reasonable period it does not disappear or drain spontaneously, it is opened through the rectum. An abscess lying against the anterior abdominal wall and resisting conservative treatment is simply drained, and no attempt is made to find the appendix, lest the protective pyogenic membrane be broken and a local peritonitis be converted into a general one. A retroperitoneal mass usually disappears under observation, but in those few cases in which drainage is necessary the intact peritoneum is rolled medially, and the abscess is approached through a lateral incision and opened from behind. An encapsulated abscess unattached to either the anterior or the posterior part of the peritoneum and encountered unexpectedly at opera-

tion may be left and the abdomen closed in the hope that spontaneous absorption will occur, or it may be walled off with iodoform gauze and opened later, when adhesions are strong enough to prevent peritoneal soiling.

At times it is difficult to determine in a child who has been ill for two or three days and has marked rigidity of the rectus muscles whether the appendix is acutely inflamed, with a brisk general peritoneal reaction, or ruptured, with beginning peritonitis, or whether an abscess is beginning to form about it. Such a child is prepared for operation and anesthetized. The relaxed abdomen is again palpated for a mass, and if one is found the child is returned to its bed and treated conservatively. If no mass can be felt under anesthesia, appendectomy is performed.

Of 81 cases of appendical abscess in which the appendix was not removed, there is a history in 13 of definite recurrent attacks, in 3 of which rupture occurred a second time. Because of this likelihood of recurrence, it is our practice urgently to advise that children with this condition be brought back for appendectomy in from six to eight weeks, the time required for the infection to sterilize itself completely. In 1935 all but 2 of 15 patients with this condition returned subsequently for appendectomy. Few adhesions were found as a rule, except in cases in which the abscess had been drained.

### GENERAL OBSERVATIONS

Contrary to expectations, the highest incidence of appendicitis is in the summer months—a fact which suggests that infections of the upper part of the respiratory tract are not as important etiologically as has been supposed. However, the variations from month to month are not great enough to allow deductions and may be entirely coincidental.

Seasonal Incidence

| | Acute | Perforated | Abscess | Totals |
|---|---|---|---|---|
| January | 31 | 13 | 10 | 54 |
| February | 22 | 10 | 7 | 39 |
| March | 25 | 12 | 8 | 45 |
| April | 19 | 17 | 6 | 42 |
| May | 23 | 12 | 8 | 43 |
| June | 28 | 24 | 9 | 61 |
| July | 29 | 10 | 11 | 50 |
| August | 27 | 26 | 18 | 71 |
| September | 24 | 22 | 9 | 55 |
| October | 20 | 15 | 6 | 41 |
| November | 26 | 14 | 7 | 47 |
| December | 24 | 14 | 6 | 44 |

Few children have appendicitis in the first or the second year. Wangensteen accounts for this by the fact that in early life the appendix is more conical and therefore less easily obstructed. The high percentage of ruptured appendixes during the first four years of life is due to the acuteness of the attack and the inability of the child to indicate

symptoms accurately. For the same reasons the disease is most deadly during the first four years—19 of the 38 deaths in this study having occurred during this period of life. The mortality in the 93 cases occurring during this period was 20 per cent. The other 19 deaths occurred among 499 children between the fifth and the twelfth year, making a mortality of 3.8 per cent for older children.

Incidence in Relation to Age

| Age, Years | Acute | Perforated | Abscess | Totals |
|---|---|---|---|---|
| 1 | 0 | 1 | 2 | 3 |
| 2 | 4 | 5 | 6 | 15 |
| 3 | 2 | 23 | 4 | 29 |
| 4 | 12 | 25 | 9 | 46 |
| 5 | 15 | 15 | 8 | 38 |
| 6 | 28 | 16 | 9 | 53 |
| 7 | 35 | 19 | 13 | 67 |
| 8 | 35 | 18 | 12 | 65 |
| 9 | 34 | 15 | 9 | 58 |
| 10 | 36 | 19 | 10 | 65 |
| 11 | 51 | 16 | 9 | 76 |
| 12 | 46 | 17 | 14 | 77 |

*Symptoms.*—Typical acute appendicitis can be diagnosed by telephone, while the atypical form defies the diagnostic acumen of an entire staff and renders valueless all laboratory data. The percentage of "stomachaches" in which appendicitis is the causative factor is small, and to choose unfailingly and operate on the proper patients is, in my experience, extremely difficult. Two opposing possibilities promote caution: first, that an acutely inflamed appendix may rupture while under observation and, second, that a needless and harmful operation may be performed on a child who is coming down with some other disease, such as pneumonia, scarlet fever, tonsillitis or meningitis.

The variations in degree of pain, of tenderness and of rigidity are too well known to warrant discussion. The rectal temperature was below 99.6 F. in 32 cases of acute appendicitis and in 9 in which the appendix was perforated. While the majority of children with acute appendicitis have leukocytosis, with a count of from 15,000 to 20,000, the count was below 12,000 in 39 cases of acute appendicitis and in 25 involving rupture with peritonitis. In 5 of the fatal cases there were white cell counts below 6,000. Acute symptoms accompanied with a low white cell count indicate a grave prognosis.

Nausea and vomiting were absent in only 20 of the cases of acute appendicitis, and in all but 4 of these illness had existed for less than one day at the time of examination. In the group with perforated appendixes 10 children gave no history of vomiting. Nausea and vomiting as positive signs are valueless, but their absence suggests that appendicitis is not likely to be the causative factor.

That diarrhea is not a common finding in acute appendicitis is attested by the number of patients who were treated for this symptom

while the actual trouble was overlooked. There were 18 children with acute appendicitis who had true diarrhea, i. e., frequent watery stools not caused by medication. In the group with perforated appendix 23 had diarrhea, the manifestation appearing generally in cases of advanced peritonitis. Liquidity of feces in the presence of peritonitis is not a favorable sign of returning peristalsis unless accompanied with expulsion of gas.

*Causes of Death.*—The causes of death remain the same—catharsis and delay. Histories of the cases studied show 256 instances of admin-

TABLE 5.—*Mortality Statistics*

| Year | Number of Cases | Deaths | Percentage |
|---|---|---|---|
| 1921-25 | 49 | 5 | 10.2 |
| 1926-30 | 180 | 14 | 7.7 |
| 1931-35 | 363 | 19 | 5.2 |
| Total | 592 | 38 | 6.4 |

istration of laxatives by parents and 13 of their prescription by physicians. These figures would undoubtedly be higher if the histories were complete. Catharsis causes increased peristalsis and ruptures the weakened appendix. What is more important is that after a cathartic has been administered the parents wait for results and, when these do not ensue, give a second and often more drastic dose. While they wait they lower the chances of their child's recovery from 99 + to 80 per cent. Parents lose their children because of ignorance. All the while the advertising of laxatives and the broadcasting of their virtues continue. Our records show that the nationally advertised laxatives head the list of remedies used for stomachache. There is only one remedy for the high mortality from acute appendicitis—continued educational propaganda.

For years the medical schools have taught and emphasized to their students: "Never prescribe a cathartic for abdominal pain." Articles in laymen's magazines, radio broadcasts, advertisements by life insurance companies and talks on health have fostered this teaching. Whereas from 1921 to 1925 the ratio of ruptured to unruptured appendixes among patients admitted to the hospital for appendical treatment was 2 to 1, that ratio has been almost reversed for the years from 1931 to 1935. In the first five year period only 2 children were admitted to the hospital within the first twenty-four hours of illness; in the last five year period 35 were admitted during the first twelve hours of illness.

There has been a steady decline in mortality during the past fifteen years (table 5). From 10.2 per cent during the years from 1921 to 1925, the rate dropped to 7.7 per cent for the second five year period and to 5.2 per cent for the last five year period.

Medical Arts Building.

# ACUTE CHOLECYSTITIS COMPLICATING SCARLET FEVER

## REPORT OF TWO CASES AND REVIEW OF THE LITERATURE

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Although it is known that the gallbladder may become involved in scarlet fever, little on this subject can be found in the literature. Of the 12,352 patients with scarlet fever treated in the Willard Parker Hospital during the ten years ending Dec. 31, 1936, in only 2 has the condition been thought to be complicated by acute cholecystitis. We present here the records of these 2 patients and a review of the literature on the subject.

In the majority of cases reported, symptoms of involvement of the gallbladder became manifest in the second or third week of the disease. In the case recently observed by us, however, the gallbladder became involved in the first week of illness.

As to the pathologic basis of the condition, those who have observed cases of cholecystitis as a complication of scarlet fever differ in opinion. Schottmüller expressed the opinion that the toxin of Streptococcus haemolyticus accounts for the lesion in the gallbladder as well as for that in the liver. He said that there is a lymphocytic infiltration in the gallbladder but no acute foci of infection.[1]

Smirnowa-Zamkowa stated the belief that the streptococcus can be cultured from the gallbladder if the material for culture is taken from the mucous membrane. According to this author, the streptococcus enters the gallbladder from the mucous membrane of the stomach by way of the lymph channels; in most cases of scarlet fever the streptococcus is excreted from the gallbladder early as well as late in the disease.[2]

Fahr, on the other hand, stated that the process is toxic or allergic and not metastatic, as no foci of organisms are found in the involved

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1. Schottmüller, H.: Hepatitis and Cholecystitis: A Specific Toxic Complication of Scarlet Fever, Klin. Wchnschr. **10**:17-20 (Jan. 3) 1931.

2. Smirnowa-Zamkowa, A.: Untersuchungen der Gallenblase bei Scharlach, Virchows Arch. f. path. Anat. **261**:832-836, 1926.

organs. According to Fahr, the proliferative changes take place below the mucous membrane, which remains intact. He said he did not believe that streptococci are excreted through the bile as are typhoid bacilli.[3]

Ssawrimovitch, in reporting a case of rupture of the gallbladder following scarlet fever, said that there are two schools of thought on the subject, one claiming that there is an acute infection of the gallbladder causing rupture, and the other believing that the gallbladder enlarges because of an upset in the neural mechanism which controls emptying and filling of the organ and because of necrosis of the wall due to toxins.[4]

## REPORT OF CASES OBSERVED IN THE WILLARD PARKER HOSPITAL

The first case was observed by us recently in a ward and is presented in some detail, as it best illustrates the rare complication.

CASE 1.—J. E., a Negro boy aged 13, was admitted to the Willard Parker Hospital on Oct. 26, 1936, complaining of acute abdominal pain. His illness began suddenly on October 21 with sore throat, which persisted. On October 24 the patient was seized with acute generalized abdominal pain and was observed in another hospital for this condition. On October 26 a diffuse erythematous punctate rash appeared, and the patient was transferred to the Willard Parker Hospital with the diagnosis of scarlet fever and possible appendicitis.

Physical examination revealed that he was acutely ill. The temperature was 101 F., the pulse rate 100 and the respiratory rate 20. There was a diffuse erythematous punctate rash over the neck, trunk and extremities. The conjunctivae were slightly reddened and the ear drums slightly congested. There was a strawberry tongue. The pharyngeal membrane was moderately red, and a purulent postnatal drip was noted. The tonsils were hypertrophied and congested; the lymph nodes of the neck were palpable. The heart was normal. There was dulness over the right lower part of the chest; there were no alterations in breath or voice sounds. The abdomen was held tense and rigid, especially on the right side, the maximal rigidity being over the right upper quadrant. Rectal examination revealed tenderness on the right side but no masses. The extremities and reflexes were normal.

Laboratory tests gave the following data: The white blood cell count was 21,750, with polymorphonuclear neutrophils 94 per cent (13 per cent being nonsegmented and 81 per cent segmented forms, with many toxic granules) and lymphocytes 6 per cent. The urine was normal. A culture of material taken from the throat on admission was positive for Staphylococcus aureus, and rare hemolytic streptococci were also found.

The diagnosis was scarlet fever complicated by acute appendicitis, possibly with a ruptured appendix and spreading peritonitis. An immediate operation was decided on. Before the operation the child was given 35 cc. of convalescent scarlet fever serum and 500 cc. of physiologic solution of sodium chloride intravenously.

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3. Fahr, T.: Proliferative Hepatitis and Cholecystitis in Scarlet Fever, Klin. Wchnschr. **10**:20-22 (Jan. 3) 1931.

4. Ssawrimovitch, H.: Scarlet Fever with Spontaneous Rupture of Gallbladder, Centralbl. f. allg. Path. u. path. Anat. **58**:49-52 (July 20) 1933.

With the patient under ether anesthesia, the abdomen was opened by Dr. Joseph R. Shaeffer with a lower right rectus incision. The appendix and the cecum were found to be normal. The right kidney was normal in position and on palpation. The gallbladder was injected and markedly distended. There was no edema or thickening and no evidence of empyema. The cystic and common ducts were normal. Because of the general picture the abdomen was closed without further surgical intervention.

*Postoperative Course.*—On the day following the operation the patient was able to take fluids, and on the second postoperative day a soft diet was taken, with no nausea. There was tenderness over the right upper quadrant for one week. On the eighth postoperative day there was noted a slight purulent drainage from the upper pole of the wound. Staph. aureus was cultured from the discharge. This drainage continued for two months. The patient's temperature remained about 102 or 103 F. for eight days after the operation; for this no cause could be found until the drainage from the wound was discovered on the eighth day. On the twelfth postoperative day the temperature suddenly rose to 104.8 F. At this time cervical adenitis was discovered. Subsequently the temperature remained around 101 F. until the twenty-fifth postoperative day, when it fell to a normal level, where it remained. The patient was discharged from the hospital, cured, on the seventieth day after the onset of illness.

Case 2.—J. H., a white boy aged 9 years, was admitted in 1930 to the Willard Parker Hospital, to the service of Dr. Leopold Brahdy. Illness began four days before admission, with sore throat, fever and a rash.

Physical examination revealed that the child was well nourished, well developed and alert. He had a flushed face, circumoral pallor, a late strawberry tongue, moderate angina and enlarged cryptic tonsils, and a small amount of grayish exudate was seen on the right tonsil. There was a moderate rash. Sinus arrhythmia was noted. A soft nontransmitted systolic bruit was heard at the apex of the heart. The lungs were clear. The liver and spleen were not felt. The temperature remained at 101 F. for two days and then fell to a normal level.

On the twenty-first day of illness the temperature suddenly rose to 102.6 F. and the pulse rate to 120; the patient vomited twice and complained of pain in the upper part of the abdomen. Physical examination at this time revealed that the skin was pale with a subicteric tinge, the scleras slightly tinged with yellow and the throat red. The ears, heart and chest were normal. There was generalized abdominal tenderness, with some muscular spasm in the right upper quadrant. The liver, spleen and kidneys were not felt. There was slight tenderness over the right kidney.

The white blood cell count was 10,200, with polymorphonuclear neutrophils 79 per cent, lymphocytes 19 per cent, monocytes 1 per cent and eosinophils 1 per cent. The diagnosis was (1) early or subacute appendicitis, (2) duodenal ulcer, (3) acutely involved gallbladder or (4) constipation. The patient was given an enema with good results. Tenderness and spasm in the right upper quadrant persisted; the icteric index was 25 on the thirtieth day of illness; the van den Bergh test gave strongly positive results. The temperature remained around 100 or 101 F. for four days and then fell by lysis to a normal level. The recovery was uneventful. The final diagnosis was scarlet fever with acute cholecystitis or hepatitis.

REVIEW OF CASES FOUND IN THE LITERATURE

CASE 1.—This patient was first observed by Dr. Hadley [5] in consultation four weeks after the patient was taken ill with scarlet fever of average severity.

On the fourth day of illness the patient, an 8½ year old child, began to have acute pain in the lower part of the right side of the abdomen. There were rigidity of the right rectus muscle and increased fever and pulse rate.

Examination revealed marked fulness of the right side of the abdomen due to an elastic mass extending from the right costal margin to a point 1½ inches (3.8 cm.) below McBurney's point. There was dulness to percussion over this area. The superficial abdominal veins were prominent. Operation was decided on. A markedly distended gallbladder was found, which when opened was found to contain 12 ounces (340 cc.) of straw-colored fluid. The gallbladder was drained by a split rubber tube with a gauze wick, which remained in situ for nine days and was then removed. The patient began to improve immediately after the operation and was able to sit up on the twelfth day. Dr. Hadley did not know whether the involvement of the gallbladder was etiologically related to scarlet fever or was coincidental with it.

CASE 2.—A boy aged 3 years and 10 months [6] had slight angina. On the third day of illness a scarlet rash appeared. The temperature was 39 C. (102.2 F.). On the fifth day the patient vomited bile and complained of severe abdominal pain. By this time the rash had faded. The temperature was 38.5 C. (101.3 F.). The abdomen was soft. In the region under the liver an irregular tender mass was felt. A questionable diagnosis of appendicitis was made. The patient was operated on immediately under ether anesthesia. The peritoneum was normal. The gallbladder was the size of a man's thumb and violet-red. It was incised and three lampwick drains were inserted. These were removed on the third, tenth and fourteenth days of illness, the last being removed with the patient under general anesthesia, with resection of the omentum to which the drain had adhered. The patient made an uneventful recovery and was discharged, cured, one week after the second operation. The bile contained rare polymorphonuclear neutrophils, a small amount of mucus, rare cocci and some large bacilli of anaerobic type which did not grow on deep gelatin.

CASE 3.—On the third day of scarlet fever a child [7] had severe abdominal pain. Examination revealed that the skin was dark and the liver large and tender. Beneath the liver the gallbladder was felt. The urine, which was dark, contained no bile or urobilin. Several days later there was bile in the urine; the blood showed a direct positive diazo reaction. At this time the liver extended 2 finger-breadths below the costal margin. The liver and gallbladder gradually returned to normal size. By the twelfth day of illness the liver and gallbladder were not palpable but the urine showed evidence of nephritis. The patient recovered.

Schottmüller [1] reported five cases of involvement of the liver, in two of which the gallbladder was palpable.

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5. Hadley, E.: Acute Cholecystitis Complicating Scarlet Fever in Child 8½ Years Old: Operation and Recovery, Indiana M. J. **27**:10, 1908.

6. Delage, J.: Gangrenous Cholecystitis During Scarlet Fever in a Child. Bull. Soc. de pédiat. de Paris **30**:249-251 (April) 1932.

7. Saxl, O., and Gross, F.: Hepatitis and Cholecystitis: Case in Scarlet Fever, Med. Klin. **28**:1168-1170 (Aug. 19) 1932.

CASE 4.—During the course of scarlet fever in a 5 year old boy a gland under the mandible enlarged and became phlegmonous. The liver enlarged until it extended a hand's breadth below the costal margin; there was pain in the region of the liver. The temperature was 40.5 C. (104.9 F.). For a short time the gallbladder was felt to be enlarged. Within fourteen days the liver and gallbladder receded and there was an uneventful rceovery.

CASE 5.—A 6 year old boy [1] had scarlet fever. On the sixth day of illness the temperature rose to 40 C. (104 F.). A painful gland was found at the angle of the right jaw. On the eighth day of illness the child complained of abdominal pain; soon the liver extended a hand's breadth below the costal margin. The gallbladder also became enlarged. Further complications were otitis media and varicella. The temperature fluctuated between 39.5 and 40.5 C. (103.1 and 104.9 F.). Suddenly, on the twenty-third day of illness, the child was seized with severe abdominal pains. The diagnosis was peritonitis caused by perforation of the gallbladder or by breaking down of a mesenteric gland. Abdominal puncture revealed hemolytic streptococci. The patient died. Autopsy revealed that the liver and gallbladder were enlarged. There was hydrops of the gallbladder, but no perforation. Microscopic examination showed no leukocytes or streptococci in the bile. Culture of the bile, however, revealed Str. haemolyticus. There were no streptococci in the wall of the gallbladder. The peritonitis had been caused by the perforation of a splenic infarct.

## SUMMARY AND CONCLUSION

Acute cholecystitis occurs rarely as a complication of scarlet fever. A discussion of the pathologic basis of the condition is presented. Two new cases are reported, and those in the literature are reviewed.

# USE OF PERCOMORPH LIVER OIL AS AN ANTIRACHITIC AGENT

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The purpose of the study to be reported was to determine the value of percomorph liver oil [1] as the sole antirachitic agent in healthy young infants, ultimate reliance being placed on roentgenologic rather than clinical criteria for detecting rickets.

There has been considerable confusion concerning adequate prophylactic dosage of vitamin D, especially of the concentrates, such as viosterol. Studies in which unassayed vitamin D products and clinical rather than roentgenologic data have been used have clouded the issue.

Shelling and Hopper [2] have pointed out the inadequacies of the early studies in which cod liver oil and viosterol were used in the prevention of rickets. There has been much controversy over the relative efficacy, unit for unit, of natural and irradiated products containing vitamin D. Recently Shelling and Hopper [2] maintained that cod liver oil and viosterol are of equal antirachitic potency in relation to the number of units of vitamin D administered. However, Davidson,

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This study was aided by a grant of money and materials from Mead Johnson & Co.

From the Department of Pediatrics, School of Medicine, University of Pennsylvania, and the University Hospital.

1. Percomorph liver oil is a blend of natural fish liver oils, the concentrations of vitamin D and of vitamin A being 100 times that of U. S. P. XI cod liver oil. The product used, which was supplied by Mead Johnson & Co., came up to the standards set forth in "New and Nonofficial Remedies" for 1937, containing 8,500 units of vitamin D (U. S. P. XI) and 60,000 units of vitamin A per gram. The preparation used in the study on biologic assay by Dr. Dorothy Whipple in the bio-assay laboratory of the Children's Hospital, Philadelphia, was proved to contain 9,500 units of vitamin D per gram (U. S. P. XI).

1 cc. percomorph liver oil = 40 drops = 8,550 U. S. P. units.

1 drop percomorph liver oil = 214 U. S. P. units.

5 drops percomorph liver oil = 1,070 U. S. P. units.

10 drops percomorph liver oil = 2,140 U. S. P. units.

2. Shelling, D. H., and Hopper, K. B.: Calcium and Phosphorus Studies. Bull. Johns Hopkins Hosp. **58**:137, 1936.

Merritt and Chipman[3] found that large doses of viosterol do not completely protect premature infants from rickets, while Shelling and Hopper reported protection in nearly all of the premature infants to whom much smaller doses of viosterol had been given.

## MATERIAL AND METHODS

One hundred infants were chosen at random from a well baby dispensary group.[4] The only specifications were that the children should be artificially fed, under 6 months of age and free from obvious disease. No attempt was made to exclude those with rickets or to perform Wassermann tests. Most of the mothers had had negative Wassermann reactions during the period of antepartum care. In view of the absence of clinical and roentgenologic signs of, and of any relationship of rickets to, syphilis, this lack of exact data is of no moment.

The diet was uniform, consisting of diluted powdered whole milk with dextrimaltose, in quantities furnishing from 50 to 60 calories per pound (45.3 Gm.) of body weight. Feeding of cereal was begun between the ages of 3 and 4 months and of sieved vegetables, a month later. Egg yolk was excluded. Vitamin C was supplied in the form of cevitamic acid, 10 mg. daily. Directions were given that the percomorph liver oil be dropped directly into the infant's mouth. A measured amount of the oil was given to each mother, with instructions that the quantity was enough for a given number of days. Any accidental excess of dosage on any one day was therefore balanced by a decreased amount on another, so that the total quantity for the period (usually two weeks) was never exceeded.

The study was conducted over a period of four and one-half months,[5] extending from December 15 to May 1. It was felt that the amount of ultraviolet radiation received from the sun during this period was minimal.

At the start every infant received 10 drops of percomorph liver oil daily. During the latter half of the period 46 of the 100 infants received only half the original daily dose.

Roentgenograms of the upper and the lower extremities were taken at the start and at the conclusion of the study. Members of the group receiving 5 drops of percomorph liver oil during the latter half of the period were examined again prior to the reduction in dosage.

Clinical examinations were made at monthly intervals. Special attention was paid to the so-called signs of rickets—bossing, craniotabes, beading of the ribs and enlargement of the epiphyses at the wrists. Notes were made of weight, length, circumference of the head, the chest and the abdomen, appearance of the teeth, ages of sitting and standing, closure of the fontanel and general health. The examinations were made exclusively by two of us. Frequent visits were made to the homes by a social worker, who furnished supplies and ascertained whether

3. Davidson, L. T.; Merritt, K. K., and Chipman, S. S.: Further Studies of Viosterol in the Prophylaxis of Rickets in the Premature Infants, Am. J. Dis. Child. **51**:594 (March) 1936.

4. Dr. Harriet Hartley, chief of the Division of Child Hygiene, Philadelphia Board of Health, aided in securing suitable subjects.

5. The period in some cases was less, owing to delay in admission to the clinic or to the necessity of terminating the study shortly before May 1, so as to complete the roentgenographic study.

directions were being followed. Unusually good cooperation was obtained from the group as a whole, and only one of the original group was dropped because of failure to cooperate.

## CLINICAL OBSERVATIONS

The criteria used in this study for the diagnosis of rickets depended entirely on the roentgen evidence, because it was felt that the clinical diagnosis of early or mild rickets was unreliable. In this group of infants frequently a clinical diagnosis of rickets would have been made in cases in which no roentgen evidence of changes in the bones could be found to support such a diagnosis. Marked craniotabes, beading of the ribs and enlargement of the epiphyses, either alone or in combination, were found throughout the study without roentgen evidence of rickets.

TABLE 1.—*Results of Administration of Percomorph Liver Oil to Infants with Rickets*

| Subject | Rachitic Status at Start | Weight at Birth | | Racial Derivation | Age at Start, Months | Dose of Percomorph Oil, Drops | Result |
|---|---|---|---|---|---|---|---|
| | | Pounds | Ounces | | | | |
| A | Mild | 4 | 8 | Negro | 3¾ | 10 | Healed |
| B | Moderate | 6 | 8 | Negro | 4½ | 10 | Healed |
| C | Very mild | 3 | 12 | Negro | 5¼ | 10 | Healed |
| D | Very mild | 7 | 6 | Negro | 3 | 10 | Healed |
| E | Very mild | 6 | 13 | Negro | 3 | 10 | Healing |
| F | Very mild | 6 | 12 | Spanish | 2¾ | 10 | Healed |
| G | Very mild | 6 | 0 | Anglo-Saxon | 4¾ | 10 | Healed |
| H | Very mild | 6 | 2 | Anglo-Saxon | 2 | 10 | Healing |
| I | Very mild | 7 | 3 | Anglo-Saxon | 2¼ | 10-5 | Healed |
| J | Very mild | 3 | 0 | Negro | 5 | 10-5 | Healed |
| K | Very mild | 7 | 9 | Anglo-Saxon | 2¾ | 10-5 | Healed |
| L | Mild | 7 | 6 | Anglo-Saxon | 2¾ | 10-5 | Healed |
| M | Very mild | 5 | 6 | Negro | 5¾ | 10-5 | Healed |
| N | Mild | 3 | 0 | Negro | 4½ | 10-5 | Healed |
| O | Very mild | 5 | 13 | Anglo-Saxon | 3¾ | 10-5 | Healed |
| P | Very mild | 8 | 12 | Anglo-Saxon | 2¼ | 10-5 | Healed |

## ROENTGENOLOGIC OBSERVATIONS

In the interpretation of the roentgenograms we often found changes so slight that there was considerable difference of opinion as to whether or not rickets was present.[6] The rickets was classified as "very mild," "mild" or "moderate." In no case was there a change sufficient to be termed "marked" or "florid" rickets. The principal difficulty in classification was in determining whether some subjects were normal or had "very mild" rickets.

## RESULTS

Of the whole group of 100 infants, 39 were Negro and 61 white. Forty-four were under 3 months, 48 between 3 and 5 months and 8 between 5 and 6 months of age. In 16 of the infants there were roentgenologic signs of rickets at the start, being "very mild" in 12, "mild" in 3 and "moderate" in 1 (table 1).

6. We are indebted to Dr. Ralph S. Bromer, of Bryn Mawr, Pa., for aid in the interpretation of roentgenograms.

An attempt was made to ascertain what vitamin D therapy members of this group of 16 rachitic infants had had prior to the administration of percomorph liver oil. Two infants had had no vitamin D; 1 had been receiving 10 drops of viosterol daily, and the other 13 had been getting from 1 to 2 teaspoonfuls of cod liver oil daily, according to their mothers' statements. These 16 rachitic infants served to illustrate the effect of percomorph liver oil as a curative agent in mild rickets. Eight in this group received 10 drops of percomorph liver oil daily for four and one-half months. All but 2 were completely healed. These 2 showed incomplete healing. The remaining 8 of this rachitic group

TABLE 2.—*Results in 21 Infants in Whom Roentgen Evidence of Rickets Appeared During Period of Administration of Percomorph Liver Oil*

| Infant | Weight at Birth Lb. | Weight at Birth Oz. | Racial Derivation | Age During Study, Months | Gain in Weight Lb. | Gain in Weight Oz. | Roentgenologic Degree of Rickets | Dose at Time of Development of Rickets, Drops | Results |
|---|---|---|---|---|---|---|---|---|---|
| 1. L. B. | 7 | 3 | Anglo-Saxon | 2¼-6¾ | 3 | 8 | Very mild | 5 | No healing |
| 2. F. C. | 6 | 9 | Italian | 2¼-6½ | 5 | 15 | Very mild | 5 | No healing |
| 3. T. L. | 7 | 5 | Anglo-Saxon | 1 -5½ | 5 | 7 | Very mild | 5 | Healed |
| 4. S. H. | 6 | .. | Negro | 1 -5 | 5 | 13 | Very mild | 5 | Healing |
| 5. M. E. | 7 | 10 | Jewish | 2¼-6 | 6 | 4 | Very mild | 10 | Healed on 5 drops |
| 6. R. McL. | 6 | 4 | Anglo-Saxon | 2½-5¾ | 3 | 2½ | Very mild | 10 | Healed on 5 drops |
| 7. B. W. | 5 | 11 | Negro | 4 -8 | 3 | 6½ | Very mild | 10 | Healed on 5 drops |
| 8. M. D. | 8 | 1 | Italian | 3¾-8 | 6 | 13 | Very mild | 10 | Healed on 5 drops |
| 9. M. D. | 7 | .. | Negro | 1¼-5½ | 6 | 4 | Very mild | 10 | Healed on 10 drops |
| 10. L. D. | 7 | 12 | Negro | 1¼-6 | 7 | 8 | Very mild | 10 | Healed on 10 drops |
| 11. L. D. | 6 | 1 | Anglo-Saxon | 1½-6 | 4 | 8 | Very mild | 10 | Healing on 10 drops |
| 12. W. G. | 8 | 12 | Negro | 1 -5 | 9 | 9 | Very mild | 10 | Healing on 10 drops |
| 13. C. G. | 6 | 3 | Negro | 1¾-5½ | 5 | 1 | Very mild | 10 | Healed on 10 drops |
| 14. D. K. | 8 | 12 | Anglo-Saxon | 5 19½ | 3 | 13 | Very mild | 10 | Healing on 10 drops |
| 15. M. McG. | 6 | 3 | Anglo-Saxon | 1¾-6¼ | 6 | 2 | Very mild | 10 | Healed on 10 drops |
| 16. A. O'S. | 8 | 1 | Anglo-Saxon | 3¼-7¼ | 7 | 0 | Very mild | 10 | Healed on 10 drops |
| 17. M. P. | 5 | 14 | Italian | 1¾-5¾ | 6 | 1 | Very mild | 10 | Healed on 10 drops |
| 18. U. P. | 5 | 10 | Negro | 2¼-6¾ | 6 | 11 | Very mild | 10 | Healed on 10 drops |
| 19. D. S. | 8 | 14 | Anglo-Saxon | 4 -8½ | 7 | 12 | Very mild | 10 | Healed on 10 drops |
| 20. W. Q. | 6 | 3 | Negro | 1 -5½ | 9 | 1 | Mild | * | Healing on 5 drops |
| 21. M. S. | 5 | 14 | Anglo-Saxon | 1 -5 | 10 | 0 | Mild | 10 | Healing on 10 drops |

* Films taken before change to 5 drops could not be read with certainty. It was impossible to determine the approximate date of onset.

received 10 drops for the first half and 5 drops during the last half of the study. Of this group, in all 8 there had been complete healing at the end of the four and one-half month period.

There were 84 infants who were roentgenographically free from rickets at the start of the study. Of these, 46 received 10 drops of percomorph liver oil daily throughout the period of observation, while for 38 the dose was reduced to 5 drops during the last half of the period. Of these 84 infants, roentgen evidence of rickets appeared in 21 at some time during the four and one-half month period. Thus, 75 per cent of this rickets-free group of 84 were completely protected.

Of the remaining 25 per cent, only 2 showed "mild," as contrasted with "very mild," roentgen evidence of rickets. These patients, 20 and 21 (table 2), both grew rapidly during the period of observation (4⅞

inches [12.4 cm.] each) and gained 9 pounds and 1 ounce and 10 pounds (4,111 and 4,536 Gm.), respectively.

All the 21 babies remained perfectly well except for occasional head colds. Without roentgen evidence they could not have been differentiated clinically from those of the nonrachitic group.

It is interesting to note that the 11 premature infants in the group of 100 did well. None had rickets while under observation. Of the 5 who showed some rachitic osseous changes at the start of the study, all were completely healed by the end of four and one-half months. Six showed no rachitic osseous changes at any time (table 3).

TABLE 3.—*Results in Premature Infants (Weight at Birth Below 5½ Pounds [2494.8 Gm.])*

| Infant | Weight at Birth | | Racial Derivation | Age During Study, Months | Gain in Weight During Study | | Roentgenologic Diagnosis of Long Bones | Dose of Percomorph Liver Oil, Drops |
|---|---|---|---|---|---|---|---|---|
| | Lb. | Oz. | | | Lb. | Oz. | | |
| M. A. | 4 | 8 | Negro | 3¾-8 | 4 | 14 | "Mild" rickets at outset; healed in 4½ mo. | 10 |
| G. B. | 3 | 12 | Negro | 5¼-9¾ | 4 | 1 | "Very mild" rickets at outset; healed in 4½ mo. | 10 |
| C. G. | 4 | 0 | Negro twin | 4¼-8¾ | 4 | 2 | Normal throughout | 10 |
| S. G. | 4 | 7 | Negro twin | 4¼-8¾ | 5 | 5 | Normal throughout | 10 |
| C. F. | 4 | 9 | Anglo-Saxon | 1 -5½ | 6 | 9 | Normal throughout | 10-5 |
| A. B. | 4 | 14 | Anglo-Saxon | 1½-6 | 5 | 11 | Normal throughout | 10-5 |
| A. J. | 5 | 3 | Negro | 5 -9½ | 2 | 4 | Normal throughout | 10-5 |
| E. J. | 3 | 0 | Negro | 5 -9½ | 3 | 14 | "Mild" rickets at outset; healed in 2 mo. | 10-5 |
| B. M. | 5 | 5 | Negro | 5¾-10¼ | 5 | 10 | "Very mild" rickets at outset; healed in 4½ mo. | 10-5 |
| J. R. | 3 | 0 | Negro | 4¼-8¾ | 3 | 5 | "Mild" rickets at outset; healed in 4 mo. | 10-5 |
| I. W. | 5 | 4½ | Negro | 2 -6½ | 4 | 12 | Normal throughout | 10-5 |

## COMMENT

Clinically most of the group did well; with one exception the subjects were well nourished; development was normal. This phase of the study will be reported in greater detail subsequently. Teething in most of the infants began at the eighth month. None showed either clinical or roentgenologic signs of scurvy.

It is interesting to note that, even though a rather large dosage of vitamin D was used, very mild rickets developed almost as frequently as in studies in which much smaller doses of vitamin D were employed. This fact was recently noted by Drake.[7] Also it may be noted that 5 drops of percomorph liver oil apparently afforded as much protection as 10 drops.

7. Drake, T. G. H.: Comparison of Antirachitic Effects on Human Beings of Vitamin D from Different Sources, Am. J. Dis. Child. **53**:754 (March) 1937.

SUMMARY

One hundred infants were studied over a period of four and one-half months to determine the antirachitic value of percomorph liver oil.

Of 16 infants with rachitic osseous changes at the start of the study, 14 were completely healed, and 2 showed incomplete healing.

Of the 84 nonrachitic infants, 63 (75 per cent) were completely protected over a four and one-half month period.

Eleven premature infants were completely protected or healed.

Clinical signs are unreliable in diagnosing mild rickets.

The rickets which developed in the course of this study was of the mildest type and apparently of no clinical significance.

# RELATION OF THE CREATININE-HEIGHT COEFFICIENT TO VARIOUS INDEXES OF NUTRITION

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The evaluation of the nutritional status of children by means of the various indexes of nutrition, particularly by weight-height tables, has been found to be unsatisfactory (Dublin and Gebhart [1]). These standard tables are based on measurement of large numbers of children at given age levels and in America include children of different racial inheritances as well as those from various economic levels. From time to time new tables are published, the standards in which are slightly higher than those of previous periods suggesting that the dissemination of the newer knowledge of nutrition is resulting in more nearly physically fit children.[2] The inadequacy of these weight-height tables led von Pirquet [3] to develop his "pelidisi" chart, a table of nutritional evaluations based on the relation of weight to sitting height: $\sqrt[3]{\frac{10 \times \text{the weight in grams}}{\text{sitting height in centimeters}}} = 100\%$. Children whose quotients were below 95 per cent were considered undernourished. Bardeen,[4] however, has shown that the formula is valid only at certain age levels; therefore, its usefulness is limited.

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Iowa Child Welfare Research Station, State University of Iowa.

The preliminary report of this study was given at the fourth annual meeting of the American Institute of Nutrition, Memphis, Tenn., April 21, 1937.

1. Dublin, L. I., and Gebhart, J. C.: Do Height and Weight Tables Identify Undernourished Children? Publication 129, New York Association for Improving the Condition of the Poor, 1924.

2. A discussion of the limitations of the various indexes, based on weight-height relationships, was given by C. H. McCloy.[6]

3. von Pirquet, C. F.: Sitzhohe und Korpergewicht, Ztschr. f. Kinderh. **14**: 211, 1916.

4. Bardeen, C. R.: The Von Pirquet Standard of Normal Body Weight as Compared with Other Standards, J. A. M. A. **77**:1988 (Dec. 17) 1921.

More recent studies have aimed to evaluate the nutritional status in relation to body build (Franzen [5] and McCloy [6]). It would seem obvious that the thick-set, stocky child should weigh more for his age and height than the slender, "asthenic" one; yet studies with animals have shown that body build is not inviolable. Restriction in any one of several nutritive constituents or anything less than "full feed" may result in retardation of growth in length as well as in width (Waters,[7] Quinn, King and Dimit [8] and Smith [9]). In line with these studies with animals are those of Bakwin, Bakwin and Milgram [10] which showed that infants from poverty-stricken homes were shorter and weighed less than those from more favorable environments; furthermore, the two groups differed in body build. Daniels and Hejinian [11] observed that infants who were given feedings of cow's milk with additions of cod liver oil were consistently heavier and better developed than the so-called normal infant, as indicated by the published curves of growth. Similarly, Stearns, Jeans and Vandecar [12] have reported that infants who were given the larger amounts of vitamin D were longer, as well as heavier, than those who received the minimum amounts. These findings are in line with Roberts'[13] summary of the effect of malnutrition on the physical well-being of the older child and emphasize that, within the limits of his heredity, the size and body build of the child are as dependent on his plane of nutrition as are those of the lower animal.

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5. Franzen, Raymond: Physical Measures of Growth and Nutrition, School Health Research Monograph no. 2, New York, American Child Health Association, 1929.

6. McCloy, C. H.: Appraising Physical Status: The Selection of Measurements, Studies in Child Welfare, Iowa City, University of Iowa, 1936, vol. 12, no. 2.

7. Waters, H. J.: The Capacity of Animals to Grow Under Adverse Conditions, paper read at the Twenty-Ninth Annual Meeting of the Society for the Promotion of Agricultural Science, 1908.

8. Quinn, E. J.; King, C. G., and Dimit, B. H.: A Study of the Effects of Certain Diets upon the Growth and Form of Albino Rats, J. Nutrition **2**:7, 1929.

9. Smith, Arthur H.: Phenomena of Retarded Growth, J. Nutrition **4**:427, 1931.

10. Bakwin, H.; Bakwin, R. M., and Milgram, L.: Body Build in Infants: IV. The Influence of Retarded Growth, Am. J. Dis. Child. **48**:1030 (Nov.) 1934.

11. Daniels, Amy L., and Hejinian, Lucea M.: Growth in Infants from the Standpoint of Physical Measurements and Nitrogen Metabolism: I. Creatinine, Am. J. Dis. Child. **37**:1128 (June) 1929.

12. Stearns, G.; Jeans, P. C., and Vandecar, V.: The Effect of Vitamin D on Linear Growth in Infancy, J. Pediat. **9**:1, 1936.

13. Roberts, Lydia J.: Nutrition Work with Children, Chicago, University of Chicago Press, 1927.

Undernutrition is first made manifest by changes in muscle tissue and fat (Aron [14]) either through lack of development during growth or through diversion of nourishment to other tissues. Waters [15] observed that

> the flesh of steers at the age of fourteen to sixteen months that had been sparsely fed throughout their lives presented the general characteristics such as color, flavor, etc. of veal or the flesh of a calf. At this age, the flesh of a highly nourished animal possessed the characteristic color, texture, and flavor of beef.

It would seem, therefore, that the musculature reflects the nutritional status. Since the quantity of endogenous urinary creatinine nitrogen is indicative of the amount of muscle tissue, the relation of this to weight, called the "creatinine coefficient," has been suggested as an index of the nutritional status (Shaffer [16]). In studying the nitrogen balance in infants Daniels and Hejinian [11] found a closer relation between length and creatinine than between weight and creatinine and postulated that the creatinine-length coefficient might give a more nearly accurate measure of a child's physical development than either the creatinine-weight coefficient or the weight-height relationship. "Other things being equal, it would seem that the infant who has a high creatinine-length coefficient is the more nearly physically fit."

## EXPERIMENTAL PROCEDURE

In order to test this hypothesis further, the creatinine-height coefficient (milligrams of creatinine divided by height in centimeters) has been determined for children between 36 and 72 months of age. Two groups were studied: (1) the children attending the preschool laboratories of the Iowa Child Welfare Research Station—a socially privileged group—and (2) the children used in our studies of metabolism who, in general, belonged to a less privileged group.

The determinations of urinary creatinine were made by the Folin method, a standard creatinine solution being used. The values for creatinine of the underprivileged group (group 2) are the averages obtained from successive five day, twenty-four hour determinations of urinary excretion. The excretion of creatinine of the children attending the preschool laboratories (group 1) was determined by analyzing urine collected at the several successive voidings during the school session. The task of collecting the urine was in charge of one of us (R. B. N.) and a graduate nurse trained in metabolic technic. To each voiding was added 2 drops of toluene. The bottles were marked with the exact time of voiding, so that the relation of the interval between voidings to the twenty-four hour excretion

14. Aron, H.: Nutrition and Growth, Philippine J. Sc. **6**:1, 1911.

15. Waters, H. J.: The Influence of Nutrition upon the Animal Form, paper read at the Thirtieth Annual Meeting of the Society for the Promotion of Agricultural Science, 1909.

16. Shaffer, P. A.: Creatinine-Weight Coefficients: Number of Milligrams of Creatinine Nitrogen Eliminated Per Kilogram of Body Weight in Twenty-Four Hours, Am. J. Physiol. **23**:1, 1908.

could be determined. Urine was collected from no more than three children during any one day. A preliminary study indicated that analysis of the urine of each

TABLE 1.—*The Relation of the Hourly Excretion of Creatinine to the Twenty-Four Hour Excretion*

| Date | Urine: Intervals Between Voidings | Urine: Amount, Cc. | Creatinine: Per Hour, Mg. | Creatinine: Per 24 Hours, Mg. |
|---|---|---|---|---|
| Protocol 1—D. B. | | | | |
| 7/17-18 | 6:30 a.m. - 7:30 a.m. | 85 | 17.6 | |
| | 7:30 a.m. - 8:30 a.m. | 155 | 17.5 | |
| | 8:30 a.m. - 9:30 a.m. | 39 | 19.3 | |
| | 9:30 a.m. - 6:00 a.m. | 750 | 16.4 | |
| | Average | | 16.6 | 399 |
| 7/18-19 | 6:00 a.m. - 7.00 a.m. | 34 | 18.2 | |
| | 7:00 a.m. - 8:00 a.m. | 158 | 17.5 | |
| | 8:00 a.m. - 9:00 a.m. | 88 | 20.2 | |
| | 9:00 a.m. - 6:00 a.m. | 660 | 16.7 | |
| | Average | | 16.9 | 406 |
| 7/19-20 | 6:00 a.m. - 6:00 a.m. | 960 | 16.5 | 396 |
| 7/20-21 | 6:00 a.m. - 6:00 a.m. | 1,320 | 16.6 | 399 |
| 7/21-22 | 6:00 a.m. - 3:00 p.m. | 915 | 17.6 | |
| | 3:00 p.m. - 4:00 p.m. | 43 | 17.5 | |
| | 4:00 p.m. - 5:00 p.m. | 153 | 18.5 | |
| | 5:00 p.m. - 6:00 a.m. | 480 | 14.9 | |
| | Average | | 16.2 | 389 |
| 7/22-23 | 6:00 a.m. - 3:00 p.m. | 765 | 18.3 | |
| | 3:00 p.m. - 4:00 p.m. | 56 | 16.7 | |
| | 4:00 p.m. - 5:00 p.m. | 90 | 20.2 | |
| | 5:00 p.m. - 6:00 a.m. | 510 | 15.9 | |
| | Average | | 17.0 | 409 |
| Protocol 2—F. V. | | | | |
| 7/17-18 | 6:40 a.m. - 7:40 a.m. | 31 | 10.7 | |
| | 7:40 a.m. - 8:40 a.m. | 230 | 11.6 | |
| | 8:40 a.m. - 9:40 a.m. | 32 | 13.0 | |
| | 9:40 a.m. - 6:00 a.m. | 550 | 10.3 | |
| | Average | | 10.6 | 253 |
| 7/18-19 | 6:00 a.m. - 6:50 a.m. | 17 | 8.9 | |
| | 6:50 a.m. - 8:00 a.m. | 67 | 12.7 | |
| | 8:00 a.m. - 9:00 a.m. | 67 | 9.2 | |
| | 9:00 a.m. - 6:00 a.m. | 515 | 10.5 | |
| | Average | | 10.5 | 253 |
| 7/19-20 | 6:00 a.m. - 6:00 a.m. | 690 | 10.5 | 252 |
| 7/20-21 | 6:00 a.m. - 6:00 a.m. | 880 | 10.3 | 248 |
| Protocol 3—F. V. | | | | |
| 7/24-25 | 6:00 a.m. - 7:00 a.m. | 40 | 11.3 | |
| | 7:00 a.m. - 8:00 a.m. | 40 | 10.7 | |
| | 8:00 a.m. -12:00 m. | 360 | 10.8 | |
| | 12:00 m.—Beef, fat-free, 50 Gm. | | | |
| | 12:00 m. - 3:00 p.m. | 300 | 12.2 | |
| | 3:00 p.m. - 4:00 p.m. | 67 | 14.3 | |
| | 4:00 p.m. - 5:00 p.m. | 74 | 18.0 | |
| | 5:00 p.m. - 6:00 a.m. | 500 | 9.9 | |
| | Average | | 10.9 | 263 |

voiding was more satisfactory than that of the pooled samples, since these several analyses could then be used as checks. The results reported are the averages of at least three and often four voidings.

The validity of the relation between the hourly voidings and the twenty-four hour excretion of creatinine has been shown by Rougichitch[17] and by Pucher and co-workers.[18] This was tested further with children who were living under controlled conditions in our metabolic ward. The protocols (table 1, protocols 1 and 2) indicate that when the amounts excreted by a given child at several voidings are averaged, the results are an aliquot of the twenty-four hour excretion of endogenous creatinine; when the urine of only one voiding is analyzed, the results may be invalid, since with young children the bladder may not be emptied completely at any single voiding.

In order to make sure that only the endogenous creatinine was measured in the studies with these preschool children (group 1), on the day preceding the urinary collections the mothers of the particular children to be studied were asked to substitute eggs or cheese for the usual meat and to give no meat for breakfast. They were also asked to report the menus during this preceding period. Excellent cooperation was obtained.

The diet of the children of the underprivileged group (group 2) generally included a small amount of meat once a day. The influence of this on the twenty-four hour urinary excretion was not sufficient to invalidate the results (table 1, protocol 3).

Determination of the creatinine coefficients of large numbers of children, particularly in school situations, would be difficult. It seems possible, however, that studies with a few children might aid in determining which of the various indexes of nutrition is most apt in evaluating nutritional status. To this end, physical measurements of each child studied were taken by trained workers of the division of physical growth of the Iowa Child Welfare Research Station.[19] The nutritional status of each child was subsequently appraised by the three standards most frequently used, namely, weight-height,[20] body build (McCloy[6]) and pelidisi (Carter[21] and Bardeen[4]). With a few of the children studied, we have been able also to compare, by means of roentgenograms of the bones of the hand and the foot, the physiologic development[22] in relation to these various indexes of nutrition. For the purpose of this study, the data pertaining to boys and to girls have been grouped together, since at this age level sex seemed to make

17. Rougichitch, O. S.: The Day and Night Creatinine and Creatine in Urine of Infants, Arch. Dis. Childhood **1**:289, 1926.

18. Pucher, G. W.; Griffith, F. R., Jr.; Brownell, K. H.; Klein, J. D., and Carmer, M. E.: Studies in Human Physiology: V. Urine Chemistry; Comparisons of Twenty-Four Hour and Short-Period; Basal Excretion; Correlations Between Urine Constituents and Menstrual and Seasonal Variation, J. Nutrition **7**:131, 1934.

19. Physical Traits of Young Children: Report of Measurements of One Hundred and Fifty Boys and One Hundred and Sixty-Seven Girls from Three to Six Years of Age, Iowa Child Welfare Research Station, Am. J. Dis. Child. **38**:541 (Sept.) 1929.

20. The tables used in evaluating weight for height were an unpublished extension of Physical Traits of Young Children, Iowa Child Welfare Research Station.[19]

21. Carter, W. E.: The Pirquet System of Nutrition and Its Applicability to American Conditions, J. A. M. A. **77**:1541 (Nov. 12) 1921.

22. White House Conference on Child Health and Protection: I. Growth and Development of the Child; Anatomy and Physiology, New York, D. Appleton-Century Company, Inc., 1933, pt. 2, pp. 26-130; Appraisement of the Child, ibid., 1932, pt. 4, pp. 258-279.

little difference in height, weight or urinary creatinine. When more data are available, boys and girls will be studied separately.

The creatinine-height coefficients of the two groups of children studied have been averaged in three month periods according to height for age, in conformity with the methods usually employed in compiling the published nutritional indexes. The relation of the corresponding nutritional evaluations of these children by the other standards has been shown by statistical correlations[23] (table 2). Unfortunately, all measurements needed for certain of the nutritional indexes for the underprivileged group (group 2) were not taken; therefore, certain of the correlations are lacking.

## RESULTS

The creatinine-height coefficients of the children studied were found to increase with age, averaging for children of the socially privileged group 2.27 for those between 28 and 30 months old and 3.49 for those from 70 to 72 months of age. The averages for the underprivileged children were considerably lower, being 1.88 for the youngest group tested, aged from 34 to 36 months, and 2.88 for the group between 70 and 72 months of age. At all age levels the highest creatinine-height coefficients of this underprivileged group were lower than those of the socially and economically privileged group, whereas the lowest values of the former group were in some cases lower and in others slightly higher than those of the latter group (chart 1). Comparisons of the creatinine-height coefficients of the children studied with evaluations by other indexes of nutrition show no consistent relationship,[24] nor is there any consistency among these other indexes (table 2).

Since height is a linear measure whereas creatinine as here used is a volume measure, it seemed possible that a more consistent relationship might be found to exist between the creatinine and the height cubed $\frac{(\text{Mg. Cr.} \times 1{,}000)}{\text{Cm. Ht.}^3}$. (For convenience in recording, the number of milligrams of creatinine obtained was multiplied by 1,000.) The data thus obtained, arranged in order of height of the subjects, showed a straight line relationship (chart 2). Furthermore, the averages were the same, 0.26 for each of the two groups of children studied (table 3). In each group there were children with high as well as those with low values. Assuming that the high values represent the superior children and the low values the less well nourished, the ratios obtained have been placed arbitrarily in four categories, the socially privileged and underprivileged groups being listed separately. In each category the

23. Helen Garside Kelly, formerly of the Iowa Child Welfare Research Station, is responsible for the statistical treatment.

24. These low and irregular correlations between the creatinine-height ratio and the other indexes used suggested that there might be a closer relation between the creatinine-weight ratio and these indexes. Correlations with these, however, were found to be no more consistent or significant than those obtained with the creatinine-height values.

TABLE 2.—*Comparison of Accepted Nutritional Indexes with Creatinine-Height Coefficients in Preschool Children from Two Socio-Economic Groups Arranged According to Age of Subjects*

| | Socially Privileged Group | | | | | | | | Underprivileged Group | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Creatinine-Height Coefficients | | | | | | | | Creatinine-Height Coefficients | | |
| | | | | | | Correlation with Nutritional Indexes | | | | | | | | |
| Age, Months | Number of Cases | Average Height, Cm. | Average Weight, Kg. | Average | Range | Body Build | Wt./Ht. | Pelidisi | Number of Cases | Average Height, Cm. | Average Weight, Kg. | Average | Range | Correlation with Ht./Wt. |
| 25-27 | 2 | 88.2 | 12.5 | 1.99 | 1.93-2.05 | .... | .... | .... | | | | | | |
| 28-30 | 11 | 91.4 | 13.8 | 2.27 ± 0.28 | 1.84-2.87 | .... | .... | .... | | | | | | |
| 31-33 | 22 | 94.7 | 14.3 | 2.39 ± 0.37 | 1.79-2.93 | 0.56 | 0.55 | 0.23 | | | | | | |
| 34-36 | 25 | 95.8 | 14.8 | 2.42 ± 0.37 | 1.81-3.71 | 0.24 | 0.17 | —0.07 | 2 | 91.0 | 13.5 | 1.88 | 1.84-1.92 | |
| 37-39 | 22 | 98.9 | 15.8 | 2.64 ± 0.40 | 1.97-3.34 | —0.04 | —0.02 | —0.02 | 6 | 92.9 | 14.3 | 2.26 ± 0.26 | 1.85-2.52 | |
| 40-42 | 13 | 98.6 | 15.7 | 2.58 ± 0.29 | 2.13-3.28 | 0.26 | 0.18 | —0.27 | 8 | 94.0 | 15.2 | 2.40 ± 0.21 | 2.10-2.63 | 0.33 |
| 43-45 | 18 | 101.6 | 16.5 | 2.68 ± 0.26 | 2.32-3.29 | | | | 10 | 96.4 | 16.1 | 2.49 ± 0.19 | 2.05-2.73 | |
| 46-48 | 28 | 101.7 | 16.7 | 2.76 ± 0.33 | 2.10-3.48 | 0.24 | —0.07 | —0.25 | 13 | 97.7 | 16.5 | 2.59 ± 0.25 | 2.20-2.94 | |
| 49-51 | 26 | 104.5 | 17.6 | 2.80 ± 0.35 | 2.02-3.58 | 0.38 | 0.08 | —0.13 | 12 | 99.0 | 15.6 | 2.35 ± 0.23 | 2.04-2.87 | 0.56 |
| 52-54 | 35 | 106.3 | 17.4 | 2.90 ± 0.25 | 2.35-3.57 | 0.22 | 0.38 | 0.11 | 15 | 100.1 | 16.3 | 2.58 ± 0.19 | 2.27-2.85 | |
| 55-57 | 37 | 107.9 | 18.1 | 3.01 ± 0.41 | 2.28-3.98 | 0.34 | 0.58 | 0.29 | 13 | 103.7 | 17.5 | 2.74 ± 0.43 | 2.21-3.71 | 0.44 |
| 58-60 | 35 | 109.1 | 18.2 | 2.98 ± 0.34 | 2.33-3.86 | 0.30 | 0.43 | 0.13 | 28 | 105.0 | 17.7 | 2.84 ± 0.27 | 2.40-3.38 | |
| 61-63 | 28 | 110.7 | 18.7 | 3.07 ± 0.43 | 2.31-3.92 | 0.12 | 0.26 | —0.05 | 26 | 107.3 | 17.8 | 3.00 ± 0.32 | 2.43-3.60 | 0.62 |
| 64-66 | 28 | 112.7 | 20.0 | 3.20 ± 0.44 | 2.47-4.16 | —0.07 | 0.41 | 0.08 | 17 | 107.7 | 19.0 | 2.92 ± 0.30 | 2.44-3.45 | |
| 67-69 | 21 | 113.6 | 20.0 | 3.28 ± 0.47 | 2.41-4.04 | 0.55 | 0.78 | 0.57 | 6 | 111.7 | 20.8 | 3.31 ± 0.32 | 2.67-3.69 | 0.34 |
| 70-72 | 21 | 115.9 | 21.1 | 3.49 ± 0.43 | 2.61-4.26 | 0.59 | 0.75 | 0.46 | 4 | 104.9 | 16.7 | 2.88 | 2.75-2.97 | |

number of children who were more than 5 per cent below the average, as determined by the two more generally accepted indexes of nutrition, namely, the body build and the weight-height standard, also have been listed. These evaluations were made on the basis of height rather than height for age. In this respect they conform to the hypothesis of Bardeen [4] to the effect that "The best basis for arranging data is the stature group." In each group of children with the highest Cr./Ht.$^3$

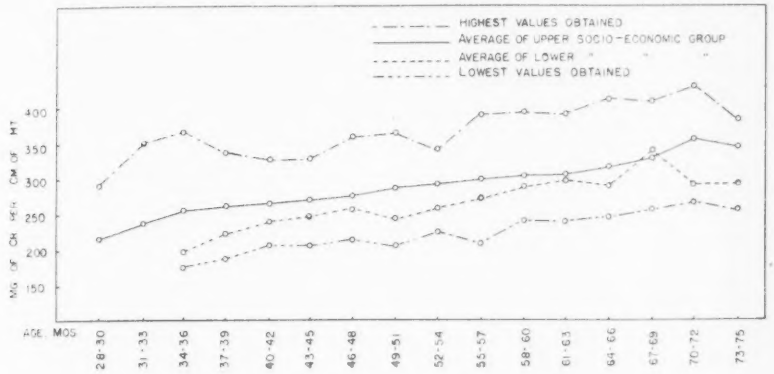


Chart 1.—Creatinine-height coefficients of preschool children in relation to age.

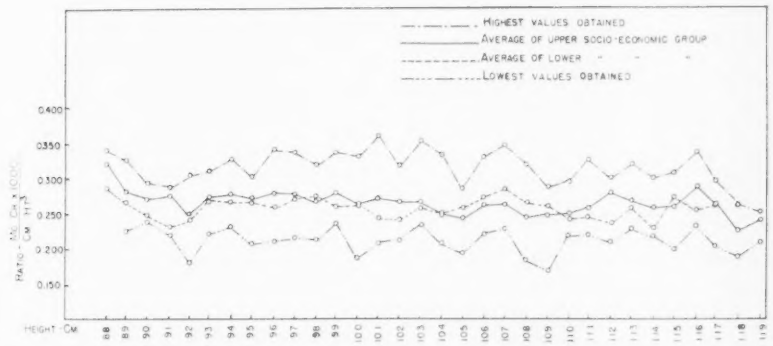


Chart 2.—Range of ratios of $\frac{\text{Milligrams of creatinine} \times 1{,}000}{\text{centimeters of height}^3}$ at various height levels.

values, presumably the superior children, there were none who were more than 5 per cent below average according to the weight-height standard, and only 5.9 per cent were below normal according to the body build standard. As the values for Cr./Ht.$^3$ decreased, the percentage of children below the average by both standards increased, the highest percentages being among the children with the lowest values. It would seem, therefore, that children with values for Cr./Ht.$^3$ below 0.264 should be classified as undernourished.

TABLE 3.—*The Relation of Nutritional Indexes of Preschool Children from Two Socio-Economic Groups, Arranged According to Ratio of Milligrams of Creatinine × 1,000 / Centimeters of Height* [3]

| Mg. Creatinine × 1,000 / Cm. Height[3] | | Number of Cases | Average Age, Mo. | Average Height, Cm. | Average Weight, Kg. | Percentage of Total | Percentage More Than 5% Underweight | |
|---|---|---|---|---|---|---|---|---|
| Range | Average | | | | | | Body Build | Ht./Wt. |
| **Socially Privileged Group** | | | | | | | | |
| 0.295-0.340 | 0.314 | 51 | 48 | 101.9 | 17.4 | 13.7 | 5.9 | 0 |
| 0.265-0.294 | 0.276 | 93 | 49 | 104.1 | 17.6 | 25.0 | 8.6 | 10.7 |
| 0.245-0.264 | 0.255 | 113 | 52 | 105.9 | 17.6 | 30.4 | 15.9 | 26.5 |
| 0.171-0.244 | 0.227 | 115 | 54 | 107.0 | 17.3 | 30.9 | 25.2 | 39.1 |
| **Underprivileged Group** | | | | | | | | |
| 0.295-0.340 | 0.312 | 11 | 59 | 105.7 | 19.5 | 6.9 | 0 | 0 |
| 0.265-0.294 | 0.279 | 51 | 54 | 101.9 | 17.7 | 31.9 | 3.3 | 2.0 |
| 0.245-0.264 | 0.254 | 57 | 56 | 102.6 | 16.7 | 35.6 | 21.7 | 21.0 |
| 0.171-0.244 | 0.229 | 41 | 57 | 104.4 | 17.1 | 25.6 | 52.6 | 14.6 |

The low correlations between the number of children estimated as undernourished by either the body build or the weight-height standard and the Cr./Ht.[3] values may be due to the fact that many of these undernourished children are too short—that is, shorter than they would have been had they been "full fed." It will be noted that with one exception the averages for height of the children of the underprivileged group (table 2) at each age level were from 1.9 to 11 cm. less than those of children of the same age in the socially privileged group. In some cases, at least, this would seem to be related to a deficiency of bone-forming material, as shown by the skeletal ages, which were determined by appraisement of the development of the bones of the hand and the foot. Three cases in point are given (table 4):

TABLE 4.—*Relation of Creatinine-Height Coefficient to Skeletal Age and Nutritional Indexes*

| Subject | Age: Chronological Yr. | Age: Chronological Mo. | Age: Skeletal,* Yr. | Weight, Kg. | Height, Cm. | Average Height for Age, Cm. | Mg. Cr. × 1,000 / Cm. Ht.[3] | Variation (in Percentage) from Theoretical Norms: Body Build | Wt./Ht. | Pelidisi |
|---|---|---|---|---|---|---|---|---|---|---|
| D. C. | 3 | 9 | 2 | 13.3 | 94.7 | 101.4 | .... | ... | −10.7 | 91.6 |
| | 4 | 7 | .. | 14.1 | 99.0 | 106.0 | 0.24 | +3 | − 8.0 | 91.5 |
| | 4 | 10 | 3− | 14.8 | 100.4 | 107.8 | 0.23 | +1 | − 4.5 | 92.5 |
| | 5 | 5 | .. | 15.7 | 104.2 | 112.7 | 0.23 | −1 | − 5.4 | 91.5 |
| | 5 | 9 | 4 | 15.9 | 106.6 | 114.6 | 0.21 | −4 | − 9.7 | 90.5 |
| | 6 | 8 | 5 | .... | ..... | ..... | .... | ... | ..... | .... |
| P. J. | 3 | 6 | 3 | 18.8 | 106.0 | 97.8 | .... | ... | + 6.0 | .... |
| | 4 | 5 | 5− | 22.5 | 112.8 | 105.3 | 0.28 | +8 | +17.0 | 98.0 |
| | 4 | 9 | .. | 22.2 | 116.0 | 107.2 | 0.29 | +3 | + 7.0 | 94.5 |
| | 5 | 4 | .. | 25.0 | 121.3 | 110.5 | 0.22† | +3 | +10.6 | 94.5 |
| | 5 | 8 | 6 | 26.2 | 124.0 | 113.2 | 0.26 | +1 | +12.0 | 95.5 |
| F. V. | 3 | 11 | .. | 15.9 | 97.9 | 102.5 | 0.24 | −2 | + 4.5 | .... |
| | 4 | 2 | 3 | 16.8 | 100.6 | 104.3 | 0.25 | +4 | + 5.2 | .... |
| | 4 | 8 | 4 | 16.7 | 105.4 | 107.8 | 0.23 | −5 | − 4.4 | .... |
| | 4 | 10 | 5 | 17.4 | 105.8 | 107.8 | 0.24 | +1 | − 0.5 | .... |
| | 5 | 2 | 5+ | 18.9 | 109.0 | 111.1 | 0.23 | −8 | + 2.7 | .... |
| | 5 | 6 | 6+ | 20.9 | 112.8 | 112.7 | 0.23 | ±0 | + 4.7 | .... |

* As indicated by development of bones of the hand and the foot.
† Following tonsillectomy.

D. C. at 4 years and 10 months showed a skeletal age of less than 3 years. He was 7.4 cm. below the average height for his age. His Cr./Ht.$^3$ coefficient $\frac{\text{Mg. Cr.} \times 1{,}000}{\text{Cm. Ht.}^3}$ fell in the lowest group. Evaluation of his nutritional status on the basis of body build showed him to be 1 per cent above the average, whereas, by the weight-height index he was 4.5 per cent below the average.

F. V. at 4 years and 2 months of age was retarded skeletally, as indicated by the roentgenograms. His creatinine-height coefficient was low, and yet he was above average by the two indexes of nutrition tested. The consistently high retentions of calcium (average 0.01 Gm. per kilogram) of this child during nine months' study added further evidence that his shortness in all probability was related to a deficiency in calcium (Daniels and her associates[25] and Fairbanks and Mitchell[26]). After an intensive program of feeding which included milk and vitamin D, at 5 years and 6 months of age the subject was up to average by all indexes excepting the creatinine-height coefficient.

P. J. was more nearly a physically superior child throughout the period of study.

## COMMENT

It is appreciated that among children of a given age there are marked variations in height, some of which obviously are attributable to differences in ancestral type while others are the results of undernutrition. Roberts[13] reported that children whose parents were not of the laboring class were at almost all ages taller and heavier than those whose parents were of the laboring group. A deficiency of calcium, of phosphorus or of vitamin D retards osseous development. Studies with animals have shown that, unless the deficiency is sufficiently marked to produce deformities, the animal will be smaller than the average, but the proportions of the body will be normal. To test this point further and to study the influence of undernutrition on certain relationships used in determining the nutritional indexes of children, three groups of rats—litter mates the ancestors of which had been inbred for many generations—were placed at weaning on rations containing different levels of calcium and phosphorus, high, average and low. At given intervals roentgenograms were taken by standard technics[27] and the measurements of the various parts of the animal were subsequently taken from these and correlated. In certain cases the relationships could not be such as are used in determining the nutritional indexes of children; for example, the nearest approach to the weight-height index was obtained by dividing the weight of the animal by the

25. Daniels, A. L.; Hutton, M. K.; Knott, E. M.; Wright, O. E., and Forman, M.: Calcium and Phosphorus Needs of Preschool Children, J. Nutrition **10**:373, 1935.

26. Fairbanks, B. W., and Mitchell, H. H.: The Relation Between Calcium Retention and the Store of Calcium in the Body, with Particular Reference to the Determination of Calcium Requirements, J. Nutrition **11**:551, 1936.

27. Dr. Florence I. Scoular and Dr. Helen L. Dawson supplied the data used in this study.

sum of the lengths of the femur, the tibia and the body. The pelidisi, so-called, was obtained by the formula $\sqrt[3]{\frac{10 \times \text{weight}}{\text{body length}}}$. For brevity, the relationships of these measurements of three animals during only two of the tested periods are given (table 5). From these it will be seen that the animals receiving diets with less than the optimum amounts of calcium and phosphorus were shorter and weighed less than their litter mates which received more nearly optimum diets. The weight-height relationship and the "pelidisi" of the animals whose diets were low in calcium were also lower, whereas the ratio of stem length to the sum of the lengths of the femur and of the tibia, as well as the ratio between the length of the body and the width at the hips, was the same in every case.

These studies with animals suggest that any system of nutritional evaluation of children, based either on body build or on the ratio of

TABLE 5.—*Influence of Variations in Diet on Proportion of Body of the Rat*

| Calcium and Phosphorus in the Diet | Rat No. | Age, Days | Length of Body, Cm. | Weight, Cm. | Weight / F. + T. + B.L.* | Pelidisi, Percentage | Length of Stem / F. + T.* | Length of Body* / Width at Hips |
|---|---|---|---|---|---|---|---|---|
| High..... | ♂ $C_1$ | 56 | 16.4 | 226 | 9.8 | 80 | 2.49 | 8.2 |
| Average.... | ♂ $A_2$ | 56 | 16.0 | 169 | 7.5 | 74 | 2.43 | 8.4 |
| Low..... | ♂ $H_1$ | 56 | 14.3 | 121 | 7.2 | 72 | 2.50 | 8.4 |
| High..... | ♂ $C_1$ | 71 | 18.1 | 289 | 11.0 | 80 | 2.50 | 8.4 |
| Average.... | ♂ $A_2$ | 71 | 17.5 | 217 | 8.5 | 74 | 2.51 | 8.3 |
| Low..... | ♂ $H_1$ | 71 | 15.0 | 150 | 6.1 | 75 | 2.50 | 8.3 |

* F. = length of femur; T. = length of tibia; B. L. = length of body.

weight to height, which does not include roentgenograms or some other means of determining skeletal development, will fail in giving a true evaluation of the person's status. In those few cases in our study with children in which the skeletal development was determined, a low skeletal age was found to coexist with a less than optimum ratio of creatinine to height. The corollary, however, was not true; that is, children with normal osseous development were found with low Cr./Ht.$^3$ values. Such a condition, it is believed, results from a diet adequate in bone-forming elements but low in other needs of the tissues. Waters observed that steers fed a submaintenance diet containing all the essential constituents grew in length at the expense of width, whereas Hogan [28] found that animals receiving a submaintenance diet differently compounded were smaller than other animals receiving full maintenance but were developed symmetrically. Thus, it would be impossible by any system of correlating physical measurements to determine to what extent

28. Hogan, A. G.: Retarded Growth and Mature Size of Beef Steers, Research Bulletin 123, University of Missouri, College of Agriculture, Agricultural Experiment Station, Columbia, Missouri, 1929.

the latter animals were suffering from undernutrition. Given persons of the same body build, the weight-height relationship would seem to be the most apt index of the nutritional status. In view of individual differences in body build, it seems possible that by means of the creatinine-height coefficient, either alone or coupled with some evaluation which includes body build and roentgenograms, some better means of evaluating nutritional status may be found.

## SUMMARY

In an attempt to ascertain the validity of the hypothesis that the creatinine-height coefficient may be a means of evaluating individual nutritional status, the ratios of $\frac{\text{Mg. Creatinine}}{\text{Cm. Height}}$ and $\frac{\text{Mg. Creatinine} \times 1{,}000}{\text{Cm. Height}^3}$ of preschool children from two socio-economic groups have been determined and correlated with evaluations by the more usual nutritional standards, namely, weight-height, body build, pelidisi and, in a few cases, skeletal age.

The findings indicate that the creatinine-height coefficient increases with age, the average of each age group being higher for socially privileged than for underprivileged children. The $\frac{\text{Mg. Cr.} \times 1.000}{\text{Cm. Ht.}^3}$ coefficients, arranged in order of height of the subjects, showed a straight line relationship, and, although the averages of both groups were the same, there were high and low values in each group. Comparisons of these coefficients with the other indexes of nutrition indicate that high $\frac{\text{Mg. Cr.} \times 1.000}{\text{Cm. Ht.}^3}$ ratios exist in children who are physically fit according to other indexes. The low correlations at the lower levels are interpreted as being due to the fact that undernutrition which results in retardation of skeletal development is not shown by weight, height or body build relationships.

# VITAMIN $B_1$ INTAKE OF NURSERY SCHOOL CHILDREN

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It is difficult to know at the present time how near to the actual intake an estimate of the vitamin $B_1$ content of any diet is likely to be, owing to the natural variability in the chemical composition of food materials (which is known to be very wide in case of the vitamins), the comparatively small numbers of assays of vitamin $B_1$ that have been done under identical conditions on any given food and the large number of foods for which quantitative data are lacking. Furthermore, there is increasing evidence that the loss of this vitamin in the preparation of food may be great. Munsell and Kifer [1] found a 50 per cent loss in cooking broccoli; Funnell,[2] a 25 per cent loss in cooking green peas only fifteen minutes, and Rose, Vahlteich, Funnell and MacLeod,[3] a 40 per cent loss in the steaming and toasting of bran to make a product for human consumption. It seemed to us of interest, therefore, to study the vitamin $B_1$ intake of some nursery school children by an assay of composite samples of the food taken by each child.

Four boys ranging in age from 40 to 55 months were selected because they were good examples of normal nursery school children and because their mothers were willing to cooperate in the collection of weighed duplicates of every item eaten for five consecutive days.

One of us supervised the collection of these duplicate samples in the nursery school at noon and also went to the homes and collected the weighed samples there. If any food was eaten between meals a duplicate of this was also kept by the mother.

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From the Child Development Institute and the Department of Nutrition, Teachers' College, Columbia University.

1. Munsell, H. E., and Kifer, H. B.: The Vitamin B Content of Raw and Cooked Broccoli, J. Home Economics **24**:823, 1932.

2. Funnell, E. H.: An Investigation of Vitamin B and Vitamin G Values in Some Seeds Used as Food, Dissert., Columbia University, 1935.

3. Rose, M. S.; Vahlteich, E. McC.; Funnell, E. H., and MacLeod, G.: Wheat Bran as a Source of Vitamin B, J. Am. Dietet. A. **7**:369, 1932.

The milk used for drinking was carefully measured but was not put into the composite samples because it would have diluted them too much. Two kinds of market milk were used, certified milk and grade B pasteurized milk, and each was assayed separately for its vitamin $B_1$ value.

TABLE 1.—*Food Intake for Five Days* *

| Food | G. | D. | E. | W. | Food | G. | D. | E. | W. |
|---|---|---|---|---|---|---|---|---|---|
| Milk | 5,190 | 5,010 | 5,110 | 3,658 | Fruits and vegetables | | | | |
| Cereals | | | | | Asparagus | 30 | | 40 | |
| Bread, white | | 57 | | 147 | Beans, string | 30 | 100 | 80 | 95 |
| Bread, whole wheat | 186 | 209 | 98 | 208 | Beans, wax | 30 | | | |
| Cornflakes | | | 10 | | Beets | 25 | 100 | 90 | 50 |
| Cream of rye | 170 | | | | Broccoli | 45 | | | |
| Cream of wheat | | | 10 | 18 | Carrots | 30 | 50 | 45 | 75 |
| Crackers, animal | | 4 | | | Cauliflower | 25 | | | |
| Crackers, graham | | 25 | | 8 | Celery | | 51 | | |
| Crackers, white | | | | 18 | Lettuce | | | 15 | 12 |
| Oatmeal | | | 225 | 90 | Onions | | 7 | | |
| Quaker crackles | | 30 | | | Parsley | | 2 | | |
| Ralston's farina | 147 | 800 | | | Peas | 90 | 50 | 85 | 25 |
| Shredded wheat | | | 10 | | Potatoes, white | 215 | 325 | 572 | 355 |
| Wheatena | 65 | | 245 | 110 | Potatoes, sweet | 47 | | | |
| Sugars and sweets | | | | | Radishes | | | 6 | |
| Candy | 17 | | 40 | | Spinach | 85 | 50 | 80 | 50 |
| Honey | | | 50 | 8 | Squash | | | 10 | |
| Jelly, grape | | 21 | | | Tomato | | | | 72 |
| Sugar | 154 | | | | Apples | | 63 | 275 | 115 |
| Fats | | | | | Apple sauce | 100 | 570 | 245 | 150 |
| Butter | | 41 | 33 | 9 | Apricots | | | 39 | |
| Cod liver oil | 55 | 46 | 46 | 25 | Bananas | 150 | 254 | 335 | 380 |
| Peanut butter | | 28 | | | Dates | | 7 | | 40 |
| Salad oil | | | 5 | | Figs | | | | 10 |
| Meats, eggs, etc. | | | | | Fruit cup | | 150 | | |
| Eggs | 40 | 130 | 100 | 75 | Grapefruit juice | | 200 | | |
| Bacon | | 11 | 27 | 10 | Oranges | | | 65 | 40 |
| Beef | | | 30 | 100 | Orange juice | 502 | 475 | 490 | 587 |
| Chicken | 30 | | | | Peaches | | | 80 | 375 |
| Halibut | | 30 | 15 | | Pears | | 200 | | |
| Lamb | | 30 | | 40 | Prunes | 16 | 50 | 17 | |
| Meat loaf | | | 20 | | Prune juice | | | | 525 |
| Miscellaneous | | | | | Tomato juice | | | | 500 |
| Chicken soup | 73 | | | | | | | | |
| Split pea soup | | | 200 | 106 | | | | | |
| Vegetable soup | | | | 132 | | | | | |
| Cocomalt | | | 25 | | | | | | |
| Ovaltine | 70 | | | | | | | | |
| Bemax | 19 | | | | | | | | |
| Protose | 52 | | | | | | | | |

* All figures indicate weight of food in grams.

TABLE 2.—*Distribution of Calories in Percentages of Total Calories*

| | G. | D. | E. | W. | Range of Four Diets Studied | Suggested Standard for Nursery School* |
|---|---|---|---|---|---|---|
| Cereals | 15.6 | 17.9 | 19.0 | 15.2 | 15-19 | 18-20 |
| Milk | 50.3 | 36.4 | 40.9 | 32.7 | 33-50 | 45-55 |
| Fruits and vegetables | 13.7 | 21.9 | 21.9 | 39.4 | 14-39 | 16-22 |
| Sugars and sweets | 10.7 | 8.3 | 5.6 | 3.3 | 3-11 | 4-8 |
| Fats | 7.7 | 10.5 | 9.0 | 3.6 | 4-11 | 1-3 |
| Meats, eggs, etc. | 2.0 | 5.0 | 3.6 | 5.8 | 2-6 | 3-5 |

* Rose, M. S.; Robb, E., and Borgeson, G. M.: Food Consumption of Nursery School Children, Child. Dev. **3**: 29, 1932.

The foods consumed are given in table 1 and the distribution of calories by typical food groups in table 2. The milk contributed from 33 to 50 per cent of the total calories in each case. Fruits and vege-

tables made the next largest contribution in three of the four cases, in two cases furnishing 22 per cent and in one 39 per cent of the total calories, and the meat group supplied from 2 to 6 per cent. A comparison of these diets with what may be regarded as a safe dietary pattern for children of nursery school age is also given in table 2. The tendency to an increasing use of fruits and vegetables is seen in these diets. It is to be noted that although the percentages of the total calories obtained from milk are, in all but one case, lower than the proposed standard, they still represent an intake close to a quart (946 cc.) a day except when the percentage falls to only 33 per cent of the total calories, in which case the total intake was about a pint and a half (710 cc.) per day.

The nutritive values of these diets as calculated from standard tables are given in table 3. It will be seen that the energy intake of these children per kilogram of body weight is well up to the standard for their age and in one case much above it. The protein intake was safe-

TABLE 3.—*Estimated Daily Food Intake Exclusive of Vitamin $B_1$* *

| Subject | Age, Mo. | Weight, Kg. | Calories | Calories per Kg. | Protein, Gm. | Calcium, Gm. | Phosphorus, Gm. | Iron, Mg. | Vitamin A Units | Vitamin C Units |
|---|---|---|---|---|---|---|---|---|---|---|
| G. | 55 | 16.1 | 1,327 | 82 | 49 | 1.25 | 1.20 | 7.4 | 11,372 | 198 |
| D. | 40 | 15.9 | 1,883 | 119 | 62 | 1.47 | 1.60 | 10.4 | 10,729 | 185 |
| E. | 47 | 19.0 | 1,711 | 90 | 55 | 1.39 | 1.46 | 9.4 | 10,212 | 205 |
| W. | 54 | 19.3 | 1,682 | 87 | 52 | 1.21 | 1.20 | 12.8 | 7,243 | 211 |

* For intake of vitamin $B_1$, see table 6.

guarded by the milk, the protein calories ranging from approximately 12 to 15 per cent of the total calories. The iron ranged from 0.55 to 0.76 mg. per hundred calories, or from 0.5 to 0.7 mg. per kilogram of body weight per day. The regular intake of cod liver oil furnished a liberal supply of vitamin A, which in all but one case consisted of more than 10,000 Sherman-Munsell units per day, and orange juice and tomato juice were the major sources of vitamin C, of which about 200 Sherman-LaMer units per day was given each child.

## THE DETERMINATION OF VITAMIN $B_1$

The combined foods of each child's diet, with the exception of milk, were thoroughly mixed by being put several times through a food chopper. The resulting mixture was placed in glass jars, sealed and kept at 38 F. until needed. Samples of the two grades of milk used by the children were purchased as needed from the dairies from which the children's milk came.

In order to find more quickly the amount of each child's diet which would yield approximately 1 Sherman-Chase unit of vitamin $B_1$, the short method described by Funnell [2] was employed for preliminary tests. This method depends on the fact that a single dose of the substance to be tested produces in a suitably depleted young rat a maximum gain in weight proportional to the amount of

vitamin $B_1$ which is fed. The average maximum gain for each group was compared with Funnell's dose-response curve.

After these preliminary tests, all further assays for vitamin $B_1$ were made by the Sherman-Chase method, a four week experimental period following the initial depletion period, which lasted till the animals ceased to gain weight. Ten animals were used for each determination. Occasionally one had to be discarded, but no test was completed with less than nine rats. In case of W.'s diet, the amount that could be given in a single dose was not large enough to induce sufficient growth for the application of this method. The first trial by the Sherman-Chase method was accordingly made arbitrarily with 3.5 Gm. per day, an amount which proved entirely inadequate to maintain growth at the desired rate of 3 Gm. per week. Thus the findings obtained by the Funnell short feeding

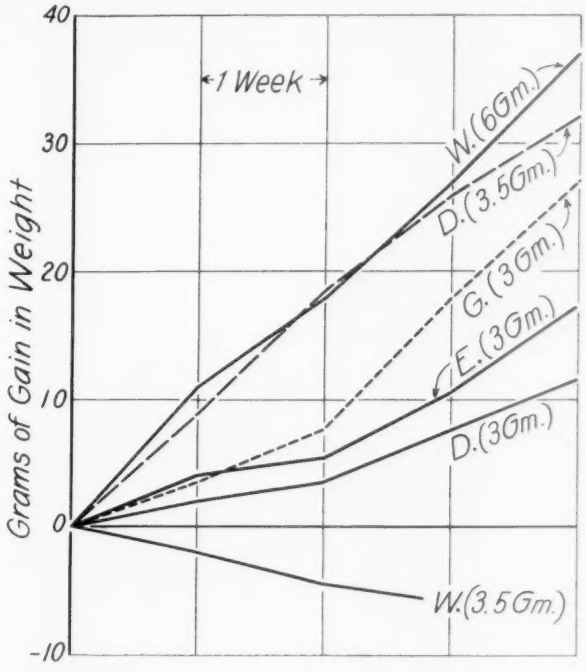


Chart 1.—Growth of rats with composite samples of the children's diets except milk as the sole source of vitamin $B_1$. The letters and figures at the ends of the growth curves indicate respectively the children from whose diets the samples were taken and the average daily weights of the samples.

method were confirmed, and another trial was necessitated, which was made at the level of 6 Gm. per day.

Tests were also made separately with cooked potato, for which no data with regard to vitamin $B_1$ content were available. Potatoes weighing about 100 Gm. each were steamed in their skins for twenty-five minutes, and then a representative cross-section was cut out for feeding purposes.

The results of tests with the children's diets are shown in chart 1 and those with milk and potatoes in chart 2.

By reference to the studies of Chase,[4] Sandels[5] and Hartley,[6] respectively, in which a given preparation was fed at numerous levels, units for the nursery school diets were interpolated; these are probably 90 to 95 per cent accurate. The average gains per week with the amounts fed and the estimates of unit values are given in table 4.

These data being used, the total vitamin $B_1$ intakes were estimated; the results are shown in table 5.

Many studies of the influence of a liberal intake of vitamin $B_1$ on the health and growth of young children have appeared in the literature in the last decade. Daniels and Byfield[7] showed definite increases in the gains in weight of a 6 month old infant fed a standard formula of modified milk supplemented by wheat germ extract, and Byfield and

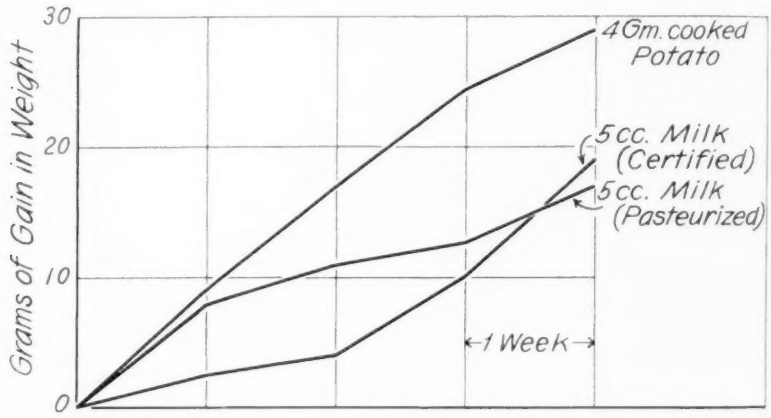


Chart 2.—Growth of rats with milk and with cooked potato as the sole source of vitamin $B_1$.

Daniels[8] found that infants fed orange juice from which vitamin $B_1$ had been removed grew less well than those fed the whole juice and

4. Chase, E. F.: A Quantitative Study of the Determination of the Antineuritic Vitamin (F or $B_1$), Dissert., Columbia University, 1928.

5. Sandels, M. R.: Relative Solubilities of the Antineuritic and Antipellagric Vitamins in Alcohol, and a Study of Certain Properties of These Substances, Dissert., Columbia University, 1928.

6. Hartley, J. G.: Factors Concerned in the Quantitative Determination of Vitamins B and G, Dissert., Columbia University, 1931.

7. Daniels, A. L., and Byfield, A. H.: The Role of the Antineuritic Vitamin in the Artificial Feeding of Infants, Am. J. Dis. Child. **18**:546 (Dec.) 1919.

8. Byfield, A. H.; Daniels, A. L., and Loughlin, R.: The Antineuritic and Growth Stimulating Properties of Orange Juice, Am. J. Dis. Child. **19**:349 (May) 1920.

that those receiving 15 cc. daily grew less well than those given 45 cc. daily, or about three times the amount necessary to prevent scurvy. Hoobler,[9] Dennett,[10] Gaynor and Dennett[11] and Bloxom[12] have all pointed out the advantages to the infant of liberal feeding of vitamin $B_1$, and Morgan and Barry[13] have shown the value of extra supplies of this factor in the diets of school children. Since the requirement of vitamin $B_1$ is proportional to the expenditure of energy as shown by Cowgill, Rosenberg and Rogoff,[14] and since the requirement is increased as the person grows larger, as shown by Osborne and

TABLE 4.—*Amounts Fed, Average Gains per Week (10 Rats) and Estimated Weights of Materials Tested to Yield Approximately One Sherman-Chase Unit of Vitamin $B_1$*

| Food | Amount Fed Daily, Gm. | Average Gain per Week, Gm. | Units per 100 Gm. | Weight to Yield 1 Unit, Gm. |
|---|---|---|---|---|
| G.'s diet except milk | 3.0 | 6.8 | 50 | 2.0 |
| D.'s diet except milk | 3.0 | 3.0 | 33 | 3.0 |
| D.'s diet except milk | 3.5 | 8.0 | | |
| E.'s diet except milk | 3.0 | 4.5 | 40 | 2.5 |
| W.'s diet except milk | 3.5 | —2.0 | | |
| W.'s diet except milk | 6.0 | 9.3 | 20 | 5.0 |
| Milk, raw | 5 cc. | 4.3 | 25 | 4.0 |
| Milk, pasteurized | 5 cc. | 4.3 | 25 | 4.0 |
| Potatoes, steamed in skins | 4.0 | 7.2 | 30 | 3.3 |

TABLE 5.—*Daily Vitamin $B_1$ Intake*

| Subject | Food Intake Except Milk, Gm. per Day | Milk Intake, Gm. per Day | Vitamin $B_1$ Units | | | |
|---|---|---|---|---|---|---|
| | | | Total per Day | Per 100 Calories | From Milk | From Other Food |
| G. | 700 | 1,038 | 606 | 46 | 260 | 346 |
| D. | 908 | 1,002 | 568 | 32 | 250 | 318 |
| E. | 888 | 1,022 | 611 | 35 | 256 | 355 |
| W. | 964 | 732 | 376 | 22 | 183 | 193 |

9. Hoobler, B. R.: Symptomatology of Vitamin B Deficiency in Infants, J. A. M. A. **91**:307 (Aug. 4) 1928; Further Observations on the Use of Vitamin B in Diets of Infants, Am. J. Dis. Child. **40**:919 (Nov.) 1930.

10. Dennett, R. H.: Routine Use of the Vitamin B Factor in Infant Feeding, J. A. M. A. **92**:769 (March 9) 1929.

11. Gaynor, M. F., and Dennett, R. H.: Rice Polishings as a Source of Vitamin B Complex in Infant Feeding, J. Pediat. **4**:507, 1934.

12. Bloxom, A. P.: Vitamin B Requirements in Infancy, Am. J. Dis. Child. **37**:1161 (June) 1929.

13. Morgan, A. F., and Barry, M. M.: Underweight Children: Increased Growth Secured Through Use of Wheat Germ, Am. J. Dis. Child. **39**:935 (May) 1930.

14. Cowgill, G. R.; Rosenberg, H. A., and Rogoff, J.: The Effect of Exercise on the Time Required for the Development of the Anorexia Characteristic of Lack of Undifferentiated Vitamin B, Am. J. Physiol. **98**:589, 1931.

Mendel,[15] there is ample evidence that the vitamin $B_1$ intake of nursery school children should be liberal. It is interesting to note, therefore, that these four carefully nurtured boys were being furnished from 375 to 600 units of vitamin $B_1$ per day, or approximately 22 to 46 units per hundred calories. Just as in the early days of nutritional investigation in this country dietary studies were a useful source of information concerning the energy requirements of men of different occupations, and just as they remain the most practical method of learning about children's total energy requirements, so dietary studies of vitamin intake, though still crude, have already made possible the establishment of tentative standards which serve as useful guides in planning children's dietary programs.[16] Cowgill [17] has proposed a formula for determining the vitamin $B_1$ requirement, but this is designed to determine only the minimal requirement. As indicated, the optimal intake has been

TABLE 6.—*Estimated Daily Intake of Vitamin $B_1$ in Sherman-Chase Units* Compared with Actual Intake*

| | G. | D. | E. | W. |
|---|---|---|---|---|
| Milk | 114 | 88 | 112 | 81 |
| Whole grain cereals | 125 | 168 | 48 | 71 |
| Fruits | 131 | 175 | 153 | 161 |
| Vegetables | 81 | 50 | 98 | 61 |
| Meats, eggs, nuts, etc. | 13 | 27 | 16 | 18 |
| Estimated total | 462 | 508 | 427 | 392 |
| Actual total | 606 | 568 | 611 | 376 |
| Excess over estimate of amount in milk | 145 | 112 | 144 | 102 |

* From data in Rose, M. S.: Laboratory Handbook for Dietetics, ed. 4, New York, The Macmillan Company, 1937.

shown to be much higher. Knott [18] has attempted to make some studies on balance, but since there is no way at present of knowing how much vitamin $B_1$ is lost in the alimentary tract, how much may develop in the feces through the growth of bacteria or how much may be lost in preparing samples of suitable concentration from urine and feces to feed to animals, true determinations of balance, such as are possible for nitrogen or for the mineral elements, are not at present possible for the vitamins. In this study no attempt was made, therefore, to estimate the output of vitamin $B_1$.

Three of the children had been under constant supervision in the nursery school for two years and one (E.) for three years, and all

15. Osborne, T. B., and Mendel, L. B.: The Role of Vitamin B in Relation to Size of Growing Rats, J. Biol. Chem. **63**:233, 1925.

16. Rose, M. S.: Laboratory Handbook for Dietetics, ed. 4, New York, The Macmillan Company, 1937, p. 27.

17. Cowgill, G. R.: The Vitamin B Requirement of Man, New Haven, Conn., Yale University Press, 1934.

18. Knott, E. M.: A Quantitative Study of the Utilization and Retention of Vitamin B by Young Children, J. Nutrition **12**:597, 1936.

were apparently in the best of health. There is good reason to believe that their intakes of vitamin $B_1$ were sufficient to maintain appetite and digestion and to support normal growth.

By reference to table 5 it will be noted that these children were obtaining from 22 to 46 units of vitamin $B_1$ per hundred calories and a total of 376 to 606 units per day. In all but one case (W.) the actual amount of vitamin $B_1$ obtained was more than the estimated intake, as is seen in table 6. This was mostly due to a much better yield from the milk than was expected, our calculations having been made on the basis of F. L. MacLeod's study [19] of Walker-Gordon milk throughout the whole year, which gave values for the four seasons ranging from 10.4 to 12.8 units per hundred grams and an average for the year of 11 units of vitamin $B_1$ per hundred grams. The milk taken by the children, both certified and pasteurized, yielded about 25 units per hundred grams. In the diet of every child milk constituted the largest single source of vitamin $B_1$, contributing 40 to 50 per cent of the total. Next to milk, the fruits were the greatest source of vitamin $B_1$ in all but one case (G.), in which the use of whole wheat bread and a whole wheat cereal with added wheat germ brought the value for the cereal group up to that for the fruits. The chief sources of vitamin $B_1$ in the fruit group were tomato and orange juice.

## SUMMARY

This study of the vitamin $B_1$ intake of four normal boys aged 40 to 55 months shows that the standard proposed as a basis of selection of food for nursery school children will furnish an adequate amount of vitamin $B_1$ for the ordinary healthy, active nursery school child, provided that at least 40 per cent of the total number of calories is derived from milk, 18 to 20 per cent from cereals, with at least half the cereal calories from whole grain products in which the vitamin $B_1$ has not been to any considerable extent destroyed by heating in manufacture, and 16 to 22 per cent from fruits and vegetables, with the daily use of 3 to 4 ounces (90 to 120 cc.) of orange juice (or its equivalent in tomato juice). No accurate prediction can be made as to the number of units such a diet will yield, because of the natural variability in foods and because of the losses which may occur in cooking or in commercial preparation; but it has been gratifying to find in the case of these children that the actual vitamin $B_1$ content of the diet is above the estimate, owing to the better yield of the milk.

The ease with which the vitamin $B_1$ content of the diet can be increased with little, if any, extra cost by the use of whole wheat bread and of a whole wheat cereal reenforced with wheat germ is shown in

19. MacLeod, F. L.; Brodie, J. B., and Macloon, E. R.: The Vitamin A, B($B_1$) and G($B_2$) Contents of Milk Throughout the Year, J. Dairy Sc. **15**:14, 1932.

D's diet. Similar results were achieved in G.'s diet by the use of added cereal germ. The diets of E. and W. are in distinct contrast to those of D. and G. in respect to the amount of vitamin $B_1$ derived from grains, although some whole grain products were used by both E. and W. The higher percentage of total calories obtained from fruits and vegetables in W's diet did not offset the lower amount obtained from the grains and from milk, his intake of vitamin $B_1$ per hundred calories being only one-half as high as G.'s and about one-third lower than the intake of either of the other children. In other words, this study not only gives information as to the actual vitamin $B_1$ intake of these children but shows the importance of liberal allowances of milk and of whole grain cereals (and the value of added germ) as regular sources of vitamin $B_1$ in the nursery school child's diet.

# Case Reports

## INFECTIONS WITH SALMONELLA SUIPESTIFER (HOG CHOLERA BACILLUS) IN CHILDHOOD

### WITH REPORT OF A CASE OF BILATERAL SUBDURAL ABSCESS ENDING IN RECOVERY

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AND
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Salmonella suipestifer is rapidly becoming recognized as a pathogen of considerable importance to man. It has long been known as the secondary invader in hog cholera, a disease due to a filtrable virus. When infections from S. suipestifer do take place in man, they may occur in either epidemic or sporadic form.

Epidemics have been reported from many parts of the world and have been characterized by gastro-enteritis or a mild typhoid-like course. Such outbreaks have been traced to the consumption of contaminated food;[1] for example, an outbreak [2] in Germany which involved one hundred and three persons was due to ice cream contaminated with bacillus suipestifer. In this country a comparable epidemic was traced to the consumption of unpasteurized milk.[3] Similarly, smaller outbreaks have been due directly to contaminated pork or to foods secondarily contaminated by the cook who had been handling infected pork.[1]

Since the World War attention has been focused on the sporadic outbreaks of bacteremia. They usually cannot be traced to contaminated food. The clinical course may be that of gastro-enteritis, an infection

From the Children's Memorial Hospital and the Otho S. A. Sprague Memorial Institute Laboratory.

1. Kuttner, Ann G.: Suipestifer Infections in Children, in Brennemann, J.: Practice of Pediatrics, Hagerstown, Md., W. F. Prior Company, Inc., 1936, vol. 2, p. 22. Kuttner, Ann G., and Zepp, H. D.: Paratyphoid-Like Fever in Children Due to the Salmonella Suipestifer Group, Bull. Johns Hopkins Hosp. **60**:373, 1932.

2. Schnitter: Zur Epidemiologie und Klinik der Bacillus suipestifer Erkrankungen des Menschen, München. med. Wchnschr. **74**:1011 (June 17) 1927.

3. Stewart, H. C., and Litterer, W.: Outbreak of Gastro-Enteritis: Milk Epidemic at Dyersburg, Tennessee, Caused by Salmonella Suipestifer, J. A. M. A. **89**:1584 (Nov. 5) 1927.

of the respiratory tract or septicemia.[4] With each type of infection there have been characteristic complications. Cholecystitis has been noted as a complication of the typhoid-like infections. The infections of the respiratory tract which developed into pneumonia were sometimes complicated by empyema. And finally, the septic conditions show a marked tendency to form suppurative foci.[5] Some of the interesting localizations are metastatic splenic abscesses, septic arthritis, osteomyelitis and pyelitis. Recently a most interesting case was reported of prolonged septicemia due to S. suipestifer with abscess within myomas of the uterus.[6] Meningitis, endocarditis and pericarditis have also occurred.

To this series of potential localizations of S. suipestifer we wish to add one not hitherto reported—subdural abscess.

## REPORT OF CASE

On March 24, 1933, J. S., a 10 month old infant, was brought to the Children's Memorial Hospital. She had been ill since the onset of chickenpox at 7 months. Two weeks after the appearance of the eruption she had a generalized convulsion, which lasted five minutes. This was said to have been unaccompanied by fever. One week later and again three weeks later there was a recurrence of convulsions, again said to have been without fever. Projectile vomiting and increasing somnolence developed. One month after the first convulsion she began to cough. Frequency of urination was also noted. She lost weight, became weak and ate poorly. The mother thought the head had been enlarging for three weeks prior to admission. At no time was there diarrhea.

The baby was born at term after six hours of labor. She was said to have weighed 3½ pounds (1.58 Kg.) and to have gained steadily until the onset of chickenpox at 7 months. The diet had been cow's milk, cereal, orange juice and cod liver oil.

The family history was not significant.

Physical examination at the time of admission revealed a small well developed but poorly nourished white infant of 10 months, who preferred to lie on her back with her left hand to her head, eloquent evidence of headache. This is well shown in figure *A*. There was moderate enlargement of the head, which measured 44.5 cm. in circumference (3.5 cm. larger than normal for a baby of 10 months). The fontanels were bulging, the sutures separated and the veins of the scalp prominent. The neck was not stiff. The left pupil was small and reacted promptly to light and in accommodation. The right pupil was dilated and reacted sluggishly. There was horizontal nystagmus. The reflexes were exaggerated, and she was hypertonic. The pulse was slow; the respirations were of the Cheyne-Stokes type, and the temperature was normal. Rachitic rosaries and craniotabes were noted.

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4. Gouley, B. A., and Israel, S. L.: Salmonella Suipestifer Bacteremia with Acute Endocarditis, Arch. Int. Med. **53**:699 (May) 1934.

5. Walker, I. J.; Weiss, S., and Nye, R. N.: Infections Due to Salmonella Suipestifer with Surgical Complications, New England J. Med. **214**:567 (March 19) 1936.

6. Gray, L. A.: Salmonella Suipestifer Infection in Myomas of Uterus, Bull. Johns Hopkins Hosp. **59**:237, 1936.

A tentative diagnosis of pachymeningitis haemorrhagica was made.

A blood count on admission showed anemia and leukocytosis; erythrocytes, 3,700,000; leukocytes, 34,000, and polymorphonuclears, 88 per cent, with many immature forms. The urine contained a marked amount of pus.

The spinal fluid was clear and under moderately increased pressure. The globulin was increased, and there were 20 cells per cubic millimeter. Examination of a direct smear revealed gram-negative bacilli and lymphocytes. The subdural punctures yielded thick greenish pus from each parietal region, thicker on the right than on the left. The direct smears of pus removed from these subdural abscesses also revealed gram-negative bacilli, which were identical with those of the spinal fluid. The further identification was accomplished some time afterward and will be discussed later.

The baby was more comfortable after the removal of 40 cc. of pus from the right subdural abscess and 20 cc. from the left. Daily subdural punctures were done over a period of five days for the purpose of decompression. From 50 to 75 cc. was removed from each side at such times.

One week after admission surgical drainage was instituted by way of the anterior fontanel by Dr. A. H. Montgomery. Right hemiplegia and a tendency to look to the right appeared immediately after operation. On the third postoperative day the discharge from the wounds resembled spinal fluid and the circumference of the head had decreased 2.5 cm. The right hemiplegia noted immediately after operation had disappeared by the twelfth postoperative day, but the deviation of the eyes to the right persisted. The nystagmus also continued to be present.

Pharyngitis developed, which was complicated by bilateral otitis media, retropharyngeal abscess and cervical adenitis. She recovered from all these and was able to go home four weeks after the operation. The residual neurologic findings at the time of discharge from the hospital consisted of: horizontal nystagmus, a tendency to look to the right, slight dilatation of the right pupil and exaggerated deep reflexes. The circumference of the head had become reduced from 44.5 cm. to 41 cm. The remarkable change in the condition is well portrayed in figure *B*.

Three years after the illness, in April 1936, the patient again came under observation. Despite the long illness her development had progressed normally. She was said to have walked at 1 year of age. When 2 years old she made short sentences. At 4 years of age she appeared mentally alert and well adjusted. She had a high forehead and some occipital flattening. The occipitofrontal circumference was 47 cm., which is normal. There was no weakness of the extraocular muscles, and the nystagmus had disappeared. The pupils and the ocular fundi were normal, and hearing was acute. The deep reflexes were still exaggerated, and there was bilateral ankle clonus. The gait, however, was normal The picture shown in figure *C* was taken at that time.

*Bacteriologic Examination.*—The organism seen in direct smears and isolated from cultures of the spinal fluid and pus from subdural abscesses was an actively motile, gram-negative bacillus giving the cultural reactions of the paratyphoid-enteritidis group. Lactose, sucrose, dulcitol, inositol, trehalose and arabinose were not fermented. Dextrose, maltose, mannitol, rhamnose and xylose were fermented, with the production of gas.

The organism proved virulent for rabbits. One cubic centimeter of a 0.001 dilution of an eighteen hour broth culture injected subcutaneously into a 5 pound (2.26 Kg.) rabbit killed the rabbit in eleven days. The organism was recovered from the heart blood.

Agglutination reactions with the antiserums of Salmonella paratyphi, Salmonella enteritidis and Salmonella aertrycke were negative. There was partial agglutination with the antiserum of Salmonella Schottmülleri in a dilution of 1:4,000. Antiserum of the nonspecific type of S. suipestifer agglutinated the organism in a dilution of 1:8,000, while antiserum of the specific type of S. suipestifer did not agglutinate the organism in any dilution. Thus, the organism was identified as the nonspecific type of S. suipestifer group II (Andrewes and Neave classification).

*A*, J. S. at 10 months of age. Bilateral subdural abscess was present. Note the enlargement of the head and the pose indicative of headache. *B*, J. S. one month after operation. The circumference of the head has decreased 2.5 cm. (Figures *A* and *B* appear also in Brennemann, I.: Practice of Pediatrics, Hagerstown, Md., W. F. Prior Company, Inc., 1936.) *C*, J. S. at 4½ years.

## COMMENT

This case of bilateral subdural abscess due to S. suipestifer is of interest not only because any new area of localization of infection gives added information regarding the pathogenesis of the organism but also because of the selection of the subdural space.

According to both Ford Robertson [7] and Rosenberg,[8] spontaneous pachymeningitis haemorrhagica, or nontraumatic subdural hematoma,

7. Robertson, Ford: Text-Book of Pathology in Relation to Mental Disease, Edinburgh, W. F. Clay, 1900.

8. Rosenberg, O.: Die Pachymeningitis hemorrhagica interna in Kindesalter, Ergebn. d. inn. Med. u. Kinderh. **20**:549, 1921.

does not occur without precedent disease. With this in mind, it will be recalled that the infant had not yet recovered from a severe attack of chickenpox when the first convulsion occurred. In the light of subsequent events it seems reasonable to accept this convulsion as the herald of pachymeningitis haemorrhagica. The symptoms progressed for three months, so that at the time of admission she presented the classic picture, with enlargement of the head, headache, nystagmus, exaggerated reflexes and emaciation. The fact that the temperature had always been normal seemed to be further evidence of a subdural hematoma.

It was not until lumbar and subdural punctures were done that the presence of infection was established. Just how long this infection had been present is uncertain, but it seems reasonable to postulate bacteremia, with localization in subdural hematomas resulting in abscesses. Whether chickenpox, septicemia or some other agent was the etiologic factor in the initiation of the hematoma which was assumed to be present is purely conjectural. The presence of a cough and the frequency of urination for two months would lead one to believe that the infection occurred about one month after the development of primary intracranial pathologic involvement. The absence of fever is unusual both in infection with S. suipestifer and in subdural abscess due to any organism, and it is hard to explain in this instance.

The recovery of this patient may be attributed to a peculiar resistance to infection with S. suipestifer in childhood and the timely drainage.

Children apparently acquire immunity against S. suipestifer more readily than adults if statistics concerning mortality can be used as an index. Of a total of sixty-seven sporadic cases in persons of all ages reported in the literature,[9] thirty-six were in children. In this group of sixty-seven patients there were twenty-two deaths, only five occurring in children. Walter, Weiss and Nye [5] have called attention to the tendency of the infection to localize in children, with a resulting higher percentage of surgical complications as compared with that for adults.

9. Weaver, James B., and Sherwood, Lorraine: Hematogenous Osteomyelitis and Pyarthrosis Due to Salmonella Suipestifer, J. A. M. A. **105**:1188 (Oct. 12) 1935. Tur, A. F., and Gartoch, O. O.: Multiple Arthritis During First Month of Life, Ztschr. f. Kinderh. **56**:696, 1934. Teveli, Z.: Salmonella Suipestifer Infection with Pyarthrosis of Shoulder Joint, Arch. f. Kinderh. **104**:41, 1934. Gajzágó, D., and Göttche, O.: Osteomyelitis Suipestifer, Am. J. Dis. Child. **49**:1270 (May) 1935. Cohen, L.; Fink, H., and Gray, I.: Salmonella Suipestifer Bacteremia with Pericarditis and Pleural Effusion, J. A. M. A. **107**:331 (Aug. 1) 1936. Roth, O.: Ueber eine Beobachtung von puerperaler Bacillus suipestifer-Infektion von septischem Charakter, Med. Klin. **24**:1828, 1928. Biddle, E.: A Case of Bacillus Suipestifer Septicemia, Brit. M. J. **2**:340 (Aug. 24) 1935. Harvey, A. M.: Salmonella Suipestifer Infection in Human Beings, Arch. Int. Med. **59**:118 (Jan.) 1937. Gouley and Israel.[4] Walker, Weiss and Nye.[5] Gray.[6]

Whereas infections due to S. suipestifer seem in general to be handled well by children, this is not necessarily true when the localization is in so ominous a place as the subdural space. In order to obtain a fairly accurate idea of the incidence and prognosis of subdural abscesses, one must examine the literature on pachymeningitis haemorrhagica, or nontraumatic subdural hematoma, in children. The only group sufficiently large to serve as a basis from which to draw conclusions is that reported by Rosenberg.[8] Of his sixty patients, thirty died in the hospital, usually of some intercurrent infection, and thirty went home. Only fifteen of the thirty who went home could be traced. Of these fifteen, four had died; among the remaining eleven there were two idiots, three imbeciles, one severely affected neuropath, one stutterer, two bed wetters and only two normal children. From the total group of sixty infants there were four who acquired secondary infection in the subdural hematoma. Despite operation in two instances, all four babies died. These babies, however, had not only secondarily infected pachymeningitis but also micro-organisms in the spinal fluid. Rosenberg concluded that the cause of death from secondarily infected pachymeningitis haemorrhagica is purulent meningitis. Of particular interest is the fact that our patient with subdural abscesses also had organisms in the spinal fluid in sufficient numbers to be demonstrated on a direct smear. It seems reasonable to suppose that adequate drainage prevented the development of generalized meningitis. In spite of Rosenberg's experience, operation for subdural abscess seems clearly indicated, as shown in our patient.

There is not in the literature any large group of cases of nontraumatic subdural hematoma treated surgically with which to compare this case. Peet[10] operated on nine infants with subdural hematoma, five of whom died. Of the four who lived, three were apparently normal at the time of discharge from the hospital and two were still free from symptoms six months later. Despite the high mortality rate, he concluded that operation is the treatment of choice. There were no infections in his series.

SUMMARY

A case of infection with S. suipestifer with localization in the subdural spaces is reported. Recovery was prompt and complete after operation.

Helen D. Zepp, of the Harriet Lane Home, of the Johns Hopkins Hospital, Baltimore, completed the identification of the organism.

707 Fullerton Avenue.

10. Peet, Max M., and Kahn, Edgar A.: Subdural Hematoma in Infants, J. A. M. A. **98**:1851 (May 28) 1932.

# MULTIPLE MALIGNANT HEMANGIO-ENDOTHELIOMAS IN AN INFANT

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NEW YORK

The pathologic and clinical concepts of malignant tumors of blood vessels have been the subjects of much discussion in recent years. The differences of opinion among numerous observers are evidenced by the fact that the condition at various times has been called angioma hypertrophicum, hemangio-endothelioma, angioblastoma, hemangio-endothelioblastoma, endotheliosarcoma, endothelioblastoma and endothelioma.

Aside from the publications of Taylor and Moore,[1] Jaffé,[2] Geschickter and Keasbey [3] and others,[4] cases of multiple endotheliomas or hemangio-endotheliomas with cutaneous involvement have not occupied much space in the literature. Jaffé,[2] in a classic review of the literature in 1929, collected about 20 cases, the majority having occurred in adults. The rarity of the condition in children, the peculiarities of the clinical course in the present case and its fatal termination warrant the presentation of this case.

## REPORT OF A CASE

S. C., a 6 week old boy of Italian parentage, was first admitted to the children's surgical service of the Bellevue Hospital on April 8, 1935, because of a large area of pigmentation over the back, which had been present since birth. From this a small pedunculated tumor had been removed for diagnostic purposes on April 1 at a different hospital. There was a small infected operative wound that required treatment. On Aug. 19, 1935 (approximately four and one-half months later), the infant was first admitted to the children's medical service of the Bellevue Hospital. At this time there was also a mass in the right upper

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1. Taylor, A. C., and Moore, E.: Multiple Hemangiomas Showing Certain Malignant Characteristics in an Infant, Am. J. Cancer **19**:31, 1933.

2. Jaffé, R. H.: Multiple Hemangiomas of the Skin and the Internal Organs, Arch. Path. **7**:44 (Jan.) 1929.

3. Geschickter, C. F., and Keasbey, L. E.: Tumors of Blood Vessels, Am. J. Cancer **23**:568, 1935.

4. (*a*) Busman, G. J.: Malignant Endotheliomas with Cutaneous Involvement: Report of Three Cases, Arch. Dermat. & Syph. **6**:680 (Dec.) 1922. (*b*) Gottheil, W. S.: Endothelioma of the Skin, J. A. M. A. **48**:93 (Jan. 12) 1907.

quadrant of the abdomen of three weeks' duration. The original area of pigmentation had neither increased in size nor changed in color. The general health of the infant was good.

The familial and the past history were not significant. Delivery had been entirely normal, except for the fact that a portion of the pedunculated tumor had been spontaneously "amputated" during the course of delivery.

Physical examination revealed a fairly well nourished and well developed boy, not acutely ill but moderately pale, with a café au lait color of the skin. The chief finding was a large, slightly elevated pigmented area on the back, hypertrichotic in spots, mahogany brown and with well demarcated, nonelevated borders extending up to the level of the hair line, down to the sacral region and laterally to the region of the anterior axillary folds (fig. 1). In addition, there were similar smaller areas scattered over the right buttock, one of which measured 5 cm. in diameter. Over both thighs and legs there were several pea-sized areas (fig. 2). An isolated area of pigmentation, the size of a silver dollar, was located on the right side of the forehead.

The abdomen was protuberant, measuring 48 cm. in circumference from crest to crest at the level of the umbilicus; the overlying skin was stretched, tense and

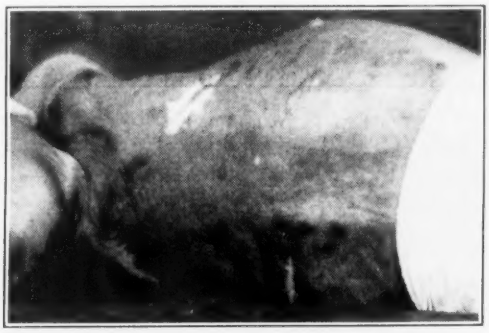

Fig. 1.—Posterior view of the infant, showing the extent of the hemangioendothelioma on the back.

shiny. Both the liver and the spleen were palpable, the former at the umbilicus and the latter 4 cm. below the left costal margin. The edge of the liver was firm and irregular, and gentle palpation in this region caused the infant to wince and cry out. It was the opinion of the attending physicians that the "abdominal mass" noted by the parents was an enlarged liver, probably filled with metastases. The remainder of the examination showed no abnormality.

*Laboratory Observations.*—On admission to the medical service the patient had a temperature of 100.6 F., a pulse rate of 104 and a respiratory rate of 34. There were 11,600 white blood cells, with 45 per cent polymorphonuclears and 55 per cent lymphocytes, and 2,600,000 red cells, with 4.7 Gm. of hemoglobin (32 per cent), determined by Sahli's method. Urinalysis and the Wassermann, Mantoux (0.1 mg.) and Schick tests gave negative results. Roentgen examination of the skull, the long bones and the chest showed no abnormalities. A flat roentgenogram of the abdomen showed it to be distended but failed to reveal any evidence of a localized mass. No abnormal areas of calcification were present.

*Course.*—The patient continued to suffer from a low grade remittent fever, the temperature ranging roughly from 100.6 to 102 F. throughout the stay in the

hospital; the pulse rate paralleled the temperature curve. The weight showed a rapid increase, from 12½ pounds (5,670 Gm.) on admission to 16 pounds (7,257 Gm.) at the end of the first week of hospitalization. The abdominal distention similarly increased 4 cm., the circumference at the level of the umbilicus being 52 cm. At this time there was felt for the first time a large rounded hard mass in the left upper quadrant of the abdomen, extending downward to within 2 cm. of the umbilicus, adherent to the deeper structures but not to the skin and not connected to the spleen.

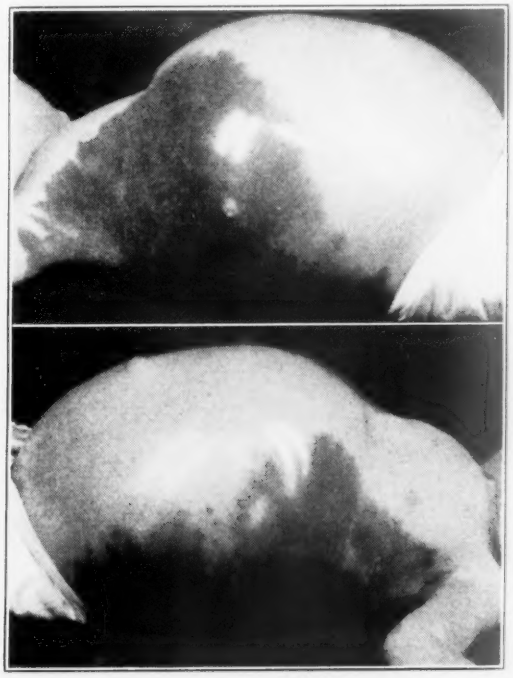

Fig. 2.—Lateral views of the infant, showing the protuberant abdomen and pigmentation (Aug. 27, 1935).

The report by Dr. L. H. Cotter of the histologic examination of the tumor taken from the pigmented area on March 9, 1935, at another hospital stated:

"A tumor measuring 9 cm. in diameter, roughly spherical, covered by skin and attached to the back by a pedicle 3 cm. in diameter. On cut section its highly vascular, friable nature was significant. On microscopic section there were numerous large areas of proliferating endothelial cells with few mitoses. Newly formed blood vessels and blood sinuses lined with endothelium were present. There were numerous areas in which the formation of blood vessels was imperfect. These were held together by a connective tissue stroma, which showed no cellular infiltration. Diagnosis: Hemangio-endothelioma."

Later biopsy specimens of the pigmented region, taken at intervals of one month or less, revealed the same histopathologic picture, and the final diagnosis was hemangio-endothelioma.

The child became more apathetic and restless; the secondary anemia was more marked (there being 1,990,000 red blood cells, with 3.6 Gm. of hemoglobin [22 per cent] at the end of the second week), and the number of white blood cells increased to 23,000, with a differential count of 90 per cent polymorphonuclears and 10 per cent lymphocytes.

The remainder of the course was progressively downhill, the severe anemia persisting despite repeated transfusions and the weight continuing to rise while the child now partook of a minimum of food.

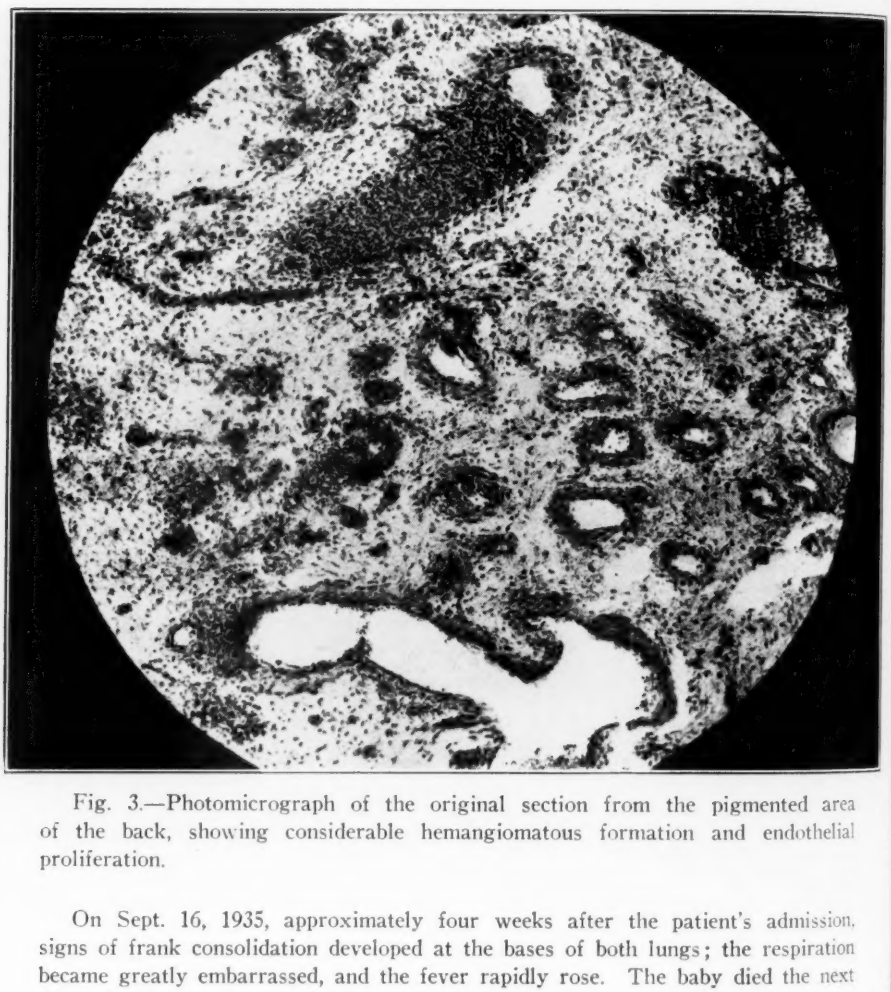

Fig. 3.—Photomicrograph of the original section from the pigmented area of the back, showing considerable hemangiomatous formation and endothelial proliferation.

On Sept. 16, 1935, approximately four weeks after the patient's admission, signs of frank consolidation developed at the bases of both lungs; the respiration became greatly embarrassed, and the fever rapidly rose. The baby died the next day. A postmortem examination was not permitted.

## COMMENT

This case is particularly interesting and instructive from several aspects: first, the presence at birth of the huge pigmented lesion and of multiple smaller ones that covered almost half of the surface of the

body; second, the traumatic "amputation" of part of the original tumor during delivery, which may have preceded the onset of malignant changes in the subsequent clinical picture; third, the clinical appearance of a malignant melanoma with metastases, while the pathologic diagnosis repeatedly revealed hemangio-endothelioma.

It is of interest to know that Ramdohr [5] in 1878 was the first to mention a case of angiosarcoma involving the inferior maxilla, the lungs and the skin in a new-born infant. Maurer [6] one year later described two cases of malignant tumors of relatively slow growth, composed of ingrowths from the endothelial linings of blood vessels; the diagnosis of these tumors, because of their tendency toward capillary and sinus formation, was angiosarcoma. Töpfer [7] in 1928 contributed a case of multiple hemangiomas of the skin, the lungs, the intestines and the liver in a 2 month old infant. The work of Jaffé [2] has already been referred to. Wollstein [8] in 1931 reported a malignant hemangioma in an infant, the organs involved being the lungs, the skin, the bronchi, the pancreas and the intestines. She also collected six other cases of multiple hemangiomas in children, in not all of which was there involvement of the lungs. Stamm [9] (cited by Wollstein [8]) reported another case of multiple hemangiomas in a 4 month old infant, the condition involving both lungs, the skin, the muscles, the ovaries, the small intestine and the cerebral cortex. The remaining cases of multiple malignant hemangiomas or hemangio-endotheliomas in infancy are included in the papers of Taylor and Moore [1] and Geschickter and Keasbey.[3]

According to Brüchanow,[10] Roggenbau [11] and Fischer [12] (all quoted by Jaffé [2]), malignant hemangiomas of the skin frequently occur in association with similar tumors of the liver. In this respect,

5. Ramdohr, P.: Ein Fall von angebornem multiplem Angiosarcom, Virchows Arch. f. path. Anat. **73**:459, 1878.

6. Maurer, F.: Ein Beitrag zur Kenntnis der Angiosarcome, Virchows Arch. f. path. Anat. **77**:346, 1879.

7. Töpfer, F.: Ueber ein infiltrierend wachsendes Hämangiom der Haut und multiple Kappilarektasien der Haut und inneren Organe, Frankfurt. Ztschr. f. Path. **36**:337, 1928.

8. Wollstein, M.: Malignant Hemangioma of the Lung with Multiple Visceral Foci, Arch. Path. **12**:562 (Oct.) 1931.

9. Stamm, C.: Beitrag zur Lehre von den Bluegefässgeschwülsten, Göttingen, W. F. Kaestner, 1891.

10. Brüchanow, N.: Ueber die Natur und Genese der cavernösen Hämangiome der Leber, Ztschr. f. Heilk. **20**:131, 1899.

11. Roggenbau, F.: Zur Kenntnis der cavernösen Angiome der Leber, Beitr. z. path. Anat. u. z. allg. Path. **49**:313, 1910.

12. Fischer, B.: Pathologie des Angioma, Ergebn. d. allg. Path. u. path. Anat. **10**:815, 1904-1905.

there may be recalled three cases noted by Geschickter and Keasbey[3] in which infants aged 9 months, 2 years and 2½ years, respectively, were affected and in all of which the condition ended fatally with widespread metastases. Jorge and Brachetto-Brián[13] reported a similar case in an infant, and they were later able to find four more cases in infants and thirteen in adults. Whether the hemangio-endothelioma in the present case was primary in the liver or in the spleen cannot be determined, since postmortem examination was not permitted, but the involvement of the liver in the generalized process was indicated by the findings on physical examination.

The relationship of trauma and external irritation to malignancy is a matter not completely settled. Whether the traumatic "amputation" of a portion of the tumor during delivery set the spark to the fire of malignant growth, so to speak, is purely a matter of speculation. In Geschickter and Keasbey's[3] classification of malignant vascular tumors, the "metastasizing hemangiomas" are often present as benign growths for many years and then show marked activity with metastasis after trauma. Of Busman's[4a] cases of malignant cutaneous endotheliomas in about 50 per cent the condition followed some form of trauma.

Malignant vascular tumors may pursue extremely varied clinical courses. There is the group of "metastasizing hemangioma" of Geschickter and Keasbey,[3] in which a rather benign course is pursued, with the health of the infant apparently unaffected until trauma or some other factor changes the outcome. There is another, rarer, group in which a more fulminating clinical sequence is observed; rapid loss of weight, cachexia, anorexia and other manifestations set in early and progress rapidly, to death within weeks or months. In still another category are tumors which clinically simulate melanotic sarcoma,[4b] the ultimate diagnosis resting on histopathologic examination. In this group, although the skin contains much pigment, the endothelioma may still be difficult to distinguish from a melanotic sarcoma.

In the case here described the features that made the condition clinically indistinguishable from malignant melanoma were as follows: first, the distribution, color and general local appearance of the lesion, and, second, the early appearance of marked secondary anemia that persisted and progressed throughout the course. The latter symptom is the most consistent, and often the earliest, finding in a case of malignant melanoma (Ewing). The one point at which the picture varied from that characteristic of melanoma was in the failure of the original lesions to increase in size or change in physical appearance.

13. Jorge, J. M., and Brachetto-Brián, D.: Hemangio-endoteliosarcoma primitivo del hígado en un nino de 5 meses, Bol. y trab. de la Soc. de cir. de Buenos Aires **17**:926 (Sept. 20) 1933.

Just as the clinical picture may vary, there may be no uniformity in the histopathologic picture. Robinson and Castleman [14] recently described a group of cases of a condition aptly termed "benign metastasizing hemangioma" in which a discrepancy existed between the clinical and the pathologic appearance, the process seeming essentially malignant with widespread metastases clinically and benign histologically. Shennan [15] described a similar series of histologically nonmalignant angiomas that demonstrated metastatic tendencies clinically, and, according to his observations, the occurrence of metastases and not the histologic picture is the deciding factor in attempts to differentiate between benign and malignant processes.

The signs of malignant growth in the microscopically benign, but potentially malignant, angiomas include the local invasive and destructive growth, the recurrence after surgical removal and the production of metastases to distant organs.[2] There is another group which shows a combination of benign and malignant features.[13]

Finally, there is the true malignant group which demonstrates, according to Kettle,[16] the following distinguishing characteristics: first, the presence of an undifferentiated, polymorphic cell type of growth; second, a whorled arrangement of cells, with the formation of elongated tubules and narrow trabeculae; third, the presence of tumor giant cells; fourth, the close association of the growth with blood vessels, and, fifth, the formation of endothelial linings or channels containing blood. According to Busman,[4a] constant features suggesting endothelial origin are the undifferentiated, polymorphic cell type of growth; the appearance within the cells of vacuoles, which in turn coalesce to form rudimentary blood spaces; the syncytial or branching forms which resemble true vasoformative cells, and the differentiation of the cells which line the newly formed spaces into typical endothelium.

SUMMARY

A case of multiple malignant hemangio-endotheliomas in a newborn infant is presented, and its interesting clinical features are discussed.

Dr. Charles Hendee Smith, professor of pediatrics at the New York University College of Medicine, accorded me permission to report this case. Dr. R. L. Nemir furnished suggestions for the report.

14. Robinson, J. W., and Castleman, B.: Benign Metastasizing Hemangioma, Ann. Surg. **104**:3, 1936.

15. Shennan, J.: Histologic Non-Malignant Angioma with Numerous Metastases, J. Path. & Bact. **19**:137, 1914.

16. Kettle, E. H.: Tumors Arising from Endothelium, Proc. Roy. Soc. Med. **11**:19, 1917-1918.

# CONGENITAL INTESTINAL ANOMALY IN A NEW-BORN INFANT

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During the past few years physicians, and pediatricians in particular, have been making earlier diagnoses in cases of masked anomalous conditions in new-born infants. This is probably due to a better understanding of the symptoms of these conditions and to the newer knowledge of the benefits of early surgical intervention.

## REPORT OF A CASE

E., a boy, was born at a private hospital. Pregnancy had been normal. Low forceps delivery was necessary, and some difficulty was encountered in delivering the posterior shoulder. There was a little trouble in resuscitation, but otherwise the baby appeared normal in every respect. After the usual interval he was put to the breast, but he did not nurse well and had a tendency to gag and vomit the milk taken. Twelve hours after delivery it was noted that he did not use his right arm and that the arm hung limp at all times. Twenty-four hours after delivery the baby vomited a large amount of greenish brown material, and he was taken off the breast. Dextrose water was offered, but only a small amount was taken. During the first twenty-four hour interval the baby had one small meconium stool.

Vomiting continued during the next twelve hour period, and the child also had another small meconium stool. At the end of this period the temperature rose to 103 F., and the baby appeared dehydrated and limp. An intern saw him and gave a solution of glucose U. S. P. in physiologic solution of sodium chloride by hypodermoclysis. During its administration the baby passed a large bloody stool. The intern, thinking of the possibility of hemorrhagic disease of the new-born, gave him 10 cc. of whole blood in each buttock. The temperature dropped rapidly to normal after the hypodermoclysis, and the baby seemed to be resting well.

The baby had several bloody stools during the next few hours, and I saw him about forty hours after delivery. The temperature was normal then, and a complete physical examination, including a digital rectal examination, revealed nothing, with the exception of a fractured right clavicle. A small amount of a special formula was made up, and 2 teaspoonfuls of barium sulfate were added to it. This was given by mouth and a roentgenogram made immediately. The stomach filled nicely, and the first and second portions of the duodenum were visualized. The fractured right clavicle was also noted. A second roentgenogram was taken two hours later, and at this time all the barium was in the stomach. A barium enema was given while the patient was under fluoroscopic observation. The sigmoid colon filled out as if it had been empty since birth. The barium traversed the sigmoid colon to the splenic flexure and then followed the transverse colon to the

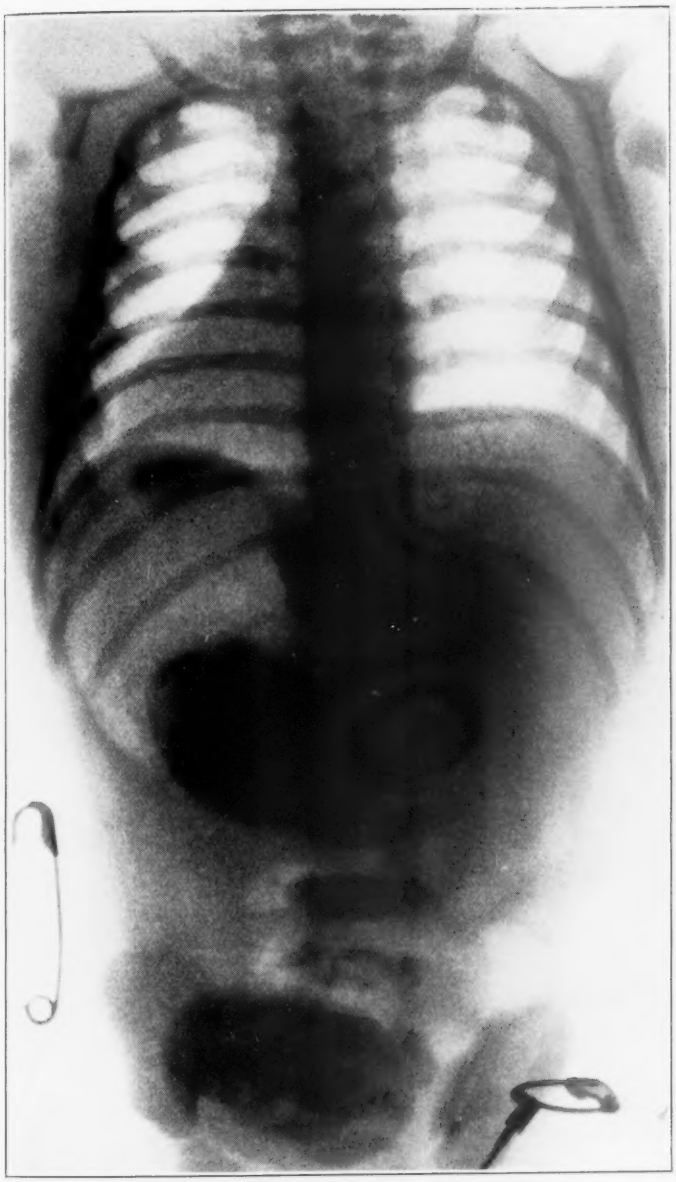

Fig. 1.—**First roentgenogram,** showing barium in the stomach and the first and second portions of the duodenum. This exposure was made immediately after ingestion of the barium sulfate. A fracture can be seen in the right clavicle.

hepatic flexure, at which point, instead of going down toward the right iliac fossa, it turned under and went parallel to the transverse colon, back to a point under the splenic flexure. The barium stopped at this point, which was thought to be the ileocecal junction. The appendix was seen to fill with barium.

The baby appeared clinically to have a high intestinal obstruction, and roentgen evidence substantiated this diagnosis. He also presented roentgen evidence of a possible embryonic failure of intestinal rotation and descent. Several possible

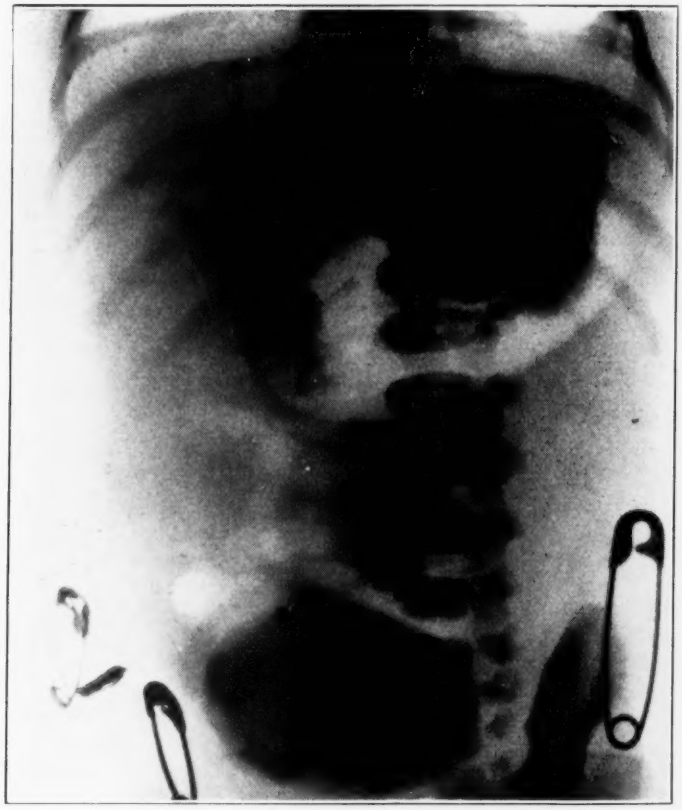

Fig. 2.—Second roentgenogram, taken two hours later, showing all the barium in the stomach.

anomalous conditions within the abdominal cavity were thought of, and for that reason operation was decided on.

Five hours after the first examination the baby was operated on. The small intestine was found to be flaccid, never having been filled, and its mesentery was definitely shortened and twisted in a two and a half turn twist, the twist having apparently cut off the supply of blood to an area in the ileum about 4 cm. in length. This area was dark and congested and nearly gangrenous in appearance. The mesentery was untwisted, the cecum pulled over to its proper position but not fixed and the abdomen closed.

For forty-eight hours after the operation nothing was given orally. Glucose U. S. P. in physiologic solution of sodium chloride was given by hypodermoclysis every six hours. The character of the stools changed remarkably during this time, and no blood was passed at the end of forty-eight hours. The baby vomited several times in the first twenty-four hours. After forty-eight hours vomiting stopped, and at this time a solution of beta lactose was given by mouth and retained. Feeding of a modified cow's milk formula was started sixty hours after operation.

Fig. 3.—Third roentgenogram, showing barium enema in the sigmoid colon, the transverse colon and the descending colon. The position of the ileocecal junction can be seen, as well as the filled appendix.

The patient remained in the hospital for sixteen days and weighed almost what he had at birth when dismissed. The stools were normal in every respect at the time of dismissal, and the baby was taking 3 ounces (90 cc.) of a modified cow's milk formula every three hours.

After one week at home, during which time the gain had been normal, he began to vomit. The vomiting was projectile, and observation of the abdomen after a feeding revealed marked peristaltic waves from left to right. At times the complete outline of the stomach could be seen. Atropine was given in

gradually increased doses over a period of three days, and the vomiting did not abate. A solution of barium sulfate was given by nasal catheter, and at the end of four hours the stomach had retained it all. A pyloric or subpyloric obstruction was suspected, and the baby was hospitalized for operation. Another roentgenogram was taken six hours after ingestion of the barium, and at this time all the barium was in the lower part of the small intestine and the colon. The operation was deferred, and a change was made in the formula. The patient continued to

Fig. 4.—Roentgenogram taken in the hospital six hours after barium meal, showing barium scattered throughout the intestinal tract. This was made on the first admission after the operation.

vomit for two days and then began to retain his food. At the end of seven days he was retaining all of the formula and gaining weight rapidly. Repeated examinations did not reveal peristaltic waves, and there never was a palpable mass in the abdomen. He was dismissed when exactly 1 month old.

During the next two weeks the baby gained rapidly and seemed to be progressing normally. At 6 weeks of age he again began to vomit projectilely, lost weight rapidly and became markedly dehydrated and weak. Barium was again given by

nasal catheter, and the roentgenogram showed the stomach well filled and emptying into the duodenum. The second portion of the duodenum, however, was markedly dilated—which suggested an obstruction either at the superior mesenteric artery or at the ligament of Treitz. After six hours a small part of the barium had passed into the jejunum, the ileum and the colon, but a larger part remained in the stomach and the dilated duodenum. The baby was again operated on.

Fig. 5.—Roentgenogram taken on second admission to hospital, showing, after six hours, most of the barium in the stomach and the dilated duodenum, with scattered amounts in the small and the large intestine.

When the abdomen was opened no free fluid was present. The small and the large intestine were collapsed and the duodenum and the stomach dilated. The duodenum passed through the mesentery of the small intestine in the right lower quadrant of the abdomen, near the ileocecal junction, and at this point was con-

stricted by the mesentery. The constriction could not be removed without a resection, and the surgeon decided to perform a jejunoduodenostomy instead. This was done by a side to side anastomosis, short circuiting around the obstruction, and the abdomen was closed.

The course for five days after the operation was stormy. During this time nothing was given orally. A blood transfusion was given about three hours after the operation. Lactate-Ringer solution and glucose U. S. P. in physiologic solution of sodium chloride were given subcutaneously every six hours for five days. Small quantities of a 5 per cent solution of dextrose were given by mouth on the sixth postoperative day. The amount of the solution was gradually increased, and two days later the feeding, every two hours, of a weak formula was instituted. The formula was strengthened gradually, and at the time of dismissal from the hospital, fourteen days after operation, the patient was receiving 4 ounces (118 cc.) of the formula every three hours. Orange juice and cod liver oil were added to the diet. The baby was 2 months old when dismissed from the hospital and weighed 8 pounds and 2 ounces (3,048 Gm.). This was exactly his weight at birth.

This baby was last seen when 8 months old, and at that time he weighed 19 pounds (8,618 Gm.). Cereal, stewed fruits, strained vegetables and egg yolk had been added to the diet, and all of these foods were being digested well. The patient's general development was excellent, and the prognosis seemed to be more than favorable.

This report was edited by Dr. Oscar M. Schloss, of New York, and Dr. Clifford G. Grulee, of Evanston, Ill.

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# ERYTHEMA MULTIFORME EXSUDATIVUM ACCOMPANYING ORAL VINCENT'S INFECTION

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AND
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In a comprehensive search of the pediatric literature we have found no recognition of erythema multiforme associated with Vincent's infection, but we have discovered references to such cutaneous manifestations in adults. Caskey [1] reported the first recognized case of toxic erythema multiforme associated with Vincent's infection and stated he had used neoarsphenamine both intravenously and locally with excellent results. At about the same time Crance [2] independently cited a case of Vincent's infection accompanied with erythema multiforme-like lesions on both hands and stated that the lesions of the mouth and the skin cleared up promptly after intravenous administration of arsphenamine. Both Caskey and Crance referred to cases of "Vincent's fusospirillary dermatitis" reported by Greenbaum,[3] in one of which there was involvement of the external auditory canal and in the other of the hands and the vulva.

In May 1936 we had the opportunity of observing an 11 year old boy with erythema multiforme exsudativum associated with a severe oral Vincent's infection. Since we can find no mention of such a phenomenon in pediatric literature, we deem this case worth reporting.

## REPORT OF A CASE

D. B., an 11 year old Puerto Rican boy, was admitted to the hospital on May 24, 1936, complaining of fever, bloody nose and pain in the neck. The onset had been acute, two days previously. The remainder of the history was irrelevant.

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From the pediatric service of Professor Jeremiah T. Simonson, of the Flower-Fifth Avenue Hospital.

1. Caskey, Charles R.: Vincent's Disease Associated with Unusual Skin Manifestations, Urol. & Cutan. Rev. **36**:370 (June) 1932.

2. Crance, Albert M.: Vincent's Disease Associated with an Erythema Multiforme-Like Eruption, Arch. Dermat. & Syph. **28**:508 (Oct.) 1933.

3. Greenbaum, S. S.: Fusospirillary Dermatitis, Arch. Dermat. & Syph. **15**:678 (June) 1927.

*Physical Examination.*—The child appeared well nourished and well developed but toxic. The temperature was 102.6 F., the pulse rate 124 and the respiratory rate, 24. The mouth had a foul odor; the tongue was coated and had prominent indentations along the edges, where there were marked necrotic ulcerations. The gums were congested and bled easily. The tonsils were hypertrophied and injected, and there was a necrotic plaque on the left one. There was prominent bilateral anterior cervical adenopathy, more marked on the left side. The eyes

Fig. 1.—Photograph of the patient on the tenth day of illness, showing the extent and nature of the eruption. The iris-shaped lesions can be seen readily on his chest, but over the rest of the trunk and the extremities the lesions are confluent. Beginning desquamation can be noted on the arms.

showed a slight palpebral conjunctivitis accompanied with a scanty mucous discharge. There was a somewhat disseminated maculopapular eruption over the extremities and part of the trunk.

*Laboratory Examination.*—Smears from the mouth and the throat showed many pus cells, abundant fusiform bacilli and many spirillas morphologically resembling Vincent's organism. Cultures of material from the nose and the throat

gave no indication of the Klebs-Loeffler bacillus. Examination of the blood revealed essentially normal values for erythrocytes, leukocytes and hemoglobin. Urinalysis and blood cultures gave negative results. Wassermann and Kahn tests were negative.

*Treatment and Course.*—The consulting dermatologists confirmed the pediatric diagnosis of the cutaneous eruption as erythema multiforme exsudativum and expressed the opinion that the condition was probably due to idiosyncrasy for some drug. However, thorough questioning failed to elicit any history of the use of or exposure to any drug. Because of the suspicion of a drug idiosyncrasy,

Fig. 2.—Photograph of the patient eleven months after discharge, showing the brownish pigmentation distributed according to the previously involved areas.

they cautioned against the use of arsenical or bismuth preparations in the treatment of the Vincent infection. Therefore, local treatment with sodium perborate was relied on. The improvement of the stomatitis in this case was a slow process, which, we now feel, could have been materially hastened without detriment to the patient by intravenous injection of neoarsphenamine.

The maculopapular eruption over the extremities and part of the trunk, as noted on admission, became more marked, but the patient never complained of pain. The lesions at first were discrete and displayed purplish red centers that appeared hemorrhagic and had iris-shaped areas of bright erythema surrounding

them. On pressure the erythema disappeared, leaving only a dull brownish central area. These lesions rapidly increased and became confluent over the greater part of the body. At first the face was not involved, but by the eighth day a few discrete lesions developed there, and the conjunctivitis became more marked. At about this time blebs began to develop over the maculopapular lesions. These blebs at first appeared over the central area but later enlarged, and where the lesions were confluent massive bullae developed. Repeated smears and cultures of material from the blebs and the bullae revealed no organisms, except on one occasion, when there was a mixed culture of staphylococci and streptococci, which was interpreted by the laboratory as an indication of contamination.

The temperature varied between 101 and 104 F. for nine days and then gradually returned to normal. This subsidence of the temperature was accompanied by improvement of the stomatitis, and the skin of the entire body began to desquamate in large sheets, leaving a raw oozing surface, which subsequently dried up without the formation of crusts. The patient then recovered uneventfully and after several negative oral and pharyngeal smears was discharged on June 24, 1936.

When seen at monthly intervals in the follow-up clinic, he presented no subjective or objective symptoms. However, the skin of the trunk and the extremities retained a brownish pigment distributed according to the previously involved areas.

## COMMENT

Crance [4] since 1933 has had five similar cases in adults which he has not yet reported, and this brings to mind the thought that the condition is perhaps more common than the literature indicates. In this light it seems particularly striking that no case in a child has been diagnosed as one of erythema multiforme exsudativum accompanying Vincent's infection, and we have been wondering if the cases of erythema multiforme exsudativum with severe stomatitis and ophthalmia reported by Stevens and Johnson,[5] Smith,[6] Wheeler,[7] Bailey [8] and Ginandes [9] might not involve related conditions. If such a contention is later found to be true, it seems logical that antispirochetal therapy should be employed in these cases.

In the original report of this condition, Stevens and Johnson stated that cultures of material from the eyes and the throat showed a mixture

4. Crance, Albert M.: Personal communication to the authors.

5. Stevens, A. M., and Johnson, F. C.: A New Eruptive Fever Associated with Stomatitis and Ophthalmia, Am. J. Dis. Child. **24**:526 (Dec.) 1922.

6. Smith, C. A.: An Unusual Case of Erythema Multiforme, Tr. Univ. Michigan Pediat. & Infect. Dis. Soc., 1929, p. 63.

7. Wheeler, J. M.: Destructive Purulent Ophthalmia Accompanying an Eruptive Fever with Stomatitis, Tr. Am. Acad. Ophth. **34**:179, 1929.

8. Bailey, J. H.: Lesions of the Cornea and Conjunctiva in Erythema Exudativum Multiforme (Hebra), Arch. Ophth. **6**:362 (Sept.) 1931.

9. Ginandes, George J.: Eruptive Fever with Stomatitis and Ophthalmia, Am. J. Dis. Child. **49**:1148 (May) 1935.

of common cocci and bacilli, with no predominating organism, but no mention was made of the results of direct smears.

In the case presented by Smith autopsy was performed, and the pathologists made a diagnosis of acute diphtheritic glossitis, pharyngitis, laryngitis, esophagitis and bronchitis. The fact that this diagnosis was made by microscopic examination of sections of tissue leaves open the possibility that the membranous inflammation might have been due to Vincent's infection, rather than to diphtheria, especially in view of the fact that repeated cultures of sputum yielded only type II pneumococci and no diphtheria bacilli.

In his article Wheeler noted that Waldie, as consulting pediatrician, believed the oral infection to be due to Vincent's angina, but Wheeler stated that repeated cultures gave negative results for diphtheria bacilli and Vincent's organisms. Smears were taken from the eyes, but no direct smears from the mouth or the throat were reported in the article.

Bailey presented three cases of this interesting entity and stated:

> Vincent's angina with its distinctive ulceromembranous pharyngitis and stomatitis presents a picture in the mouth and throat identical with that obtained in my cases. But here the similarity ends, although my cases were diagnosed by the laryngologists as Vincent's angina. In that condition, however, there is no cutaneous eruption, the eyes are not affected and the specific anaerobic micro-organism can be isolated.

In his reports of cases he said that smears and cultures from the mouth showed the micro-organisms usually found in these situations. If he considered the fusospirochetal organisms normal habitants in these situations, it may be possible that his patients had oral Vincent's infection. As regards the cutaneous eruption, we have already cited Caskey and Crance, who reported similar cutaneous eruptions as manifestations of Vincent's infection.

It was with avid interest that we read an article by Moser [10] describing five cases of acute iritis caused by chronic oral Vincent's infection, for it refuted Bailey's premise that the eyes are not affected by Vincent's angina. Moser secured actively motile, short spirillas from subgingival smears and by adequate treatment of the oral infection with local use of arsphenamine cleared up the iritis in every case. For experimental purposes he discontinued the local treatment with arsphenamine before the oral infections were cleared in two cases: the acute iritis promptly reappeared, and disappeared permanently with the resumption of adequate oral treatment.

Ginandes definitely stated that Vincent's organism was not found in his case, but he treated the ulcerative stomatitis with sodium perborate with good results.

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10. Moser, G. P.: Iritis and Other Symptoms Caused by Chronic Infections of the Mouth, Am. Med. **41**:560 (Nov.) 1935.

Mracek,[11] Stelwagon [12] and many other distinguished dermatologists have averred that erythema multiforme exsudativum is a systemic disease of infectious origin and that the eruption is due to the action of toxins or of bacterial emboli. It is our hypothesis that these phenomena are the results of the action of toxins liberated from severe fusospirochetal infections in patients with altered sensitivity of the tissues. We have seen other bizarre complications of fusospirochetal infections, and we are planning to submit in the near future a paper on the allergic phase of such infections.

Further study of this intriguing clinical entity may completely disprove our contentions. However, it seems justifiable to speculate concerning a possible etiologic relationship between the cases of Stevens and Johnson, those of Caskey and Crance and our own case, which presents a similar clinical picture. Such speculation seems especially justifiable since Ginandes [9] and Hanke [13] emphasized that variations in the severity of cutaneous and ocular manifestations do occur.

## SUMMARY

We have submitted a detailed report of a case of erythema multiforme exsudativum accompanying severe oral Vincent's infection.

Our impression is that such phenomena are more prevalent than is usually considered.

The possibility is advanced that in the cases of erythema multiforme exsudativum reported by Stevens and Johnson and others, Vincent's infection may have been an etiologic factor, associated with an altered sensitivity of the tissues.

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11. Mracek, F.: Handbuch der Hautkrankheiten, Vienna, A. Hölder, 1902, vol. 1, p. 540; cited by Bailey.[8]

12. Stelwagon, H. W.: Treatise on Diseases of the Skin, ed. 3, Philadelphia, W. B. Saunders Company, 1904, p. 147; cited by Bailey.[8]

13. Hanke, Victor: Der Herpes iris des Auges, Arch. f. Ophth. **52**:263, 1901; cited by Bailey.[8]

# Progress in Pediatrics

## HOSPITAL INFECTIONS

### I. A SURVEY OF THE PROBLEM

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The decline in the incidence of communicable diseases in recent years throughout Europe and America must be due in large part to (1) greater nonspecific resistance to disease, traceable to improvement in the physical condition of the population; (2) more widespread specific resistance as a result of active artificial immunization, and (3) improved methods of interrupting the spread of the causative agent from one person to another or of eradicating natural reservoirs of the infection. While all of these mechanisms have undoubtedly been contributory, the influence of each must have varied with the type of infection and with the portal of entry of the infecting agent. Considered in this light, communicable diseases may be classified into four groups, as shown in table 1. Some disorders may rightly fall into two separate classifications.

The technic of prevention obviously has varied among these four groups. The control of the diseases in group II has become an economic rather than a medical problem. True, typhoid and cholera can be prevented if individual resistance is increased through vaccination, but this is assuredly not the most efficient or the most economical method, nor is it the one on which physicians have come to depend. If one were in India, in China or even in certain rural communities in this country where community hygiene is poor, one would need active immunization

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against these diseases; but in urban centers, one takes for granted the watchfulness of health departments in preventing them. One might point out, in passing, the contribution of the pediatrician to this advance, through his long fight for clean milk. Further, it should be noted that infant feeding has become a simple matter with the use of clean milk, whereas it was difficult when alterations in the chemical composition of formulas were used in the attempt to counterbalance bad and unclean food substances.

The control of the diseases in group IV also has become an economic rather than a medical problem, for if the community can afford to eradicate this intermediary vector the disease loses its menace. For

TABLE 1.—*Communicable Diseases Classified According to Portal of Entry*

| | |
|---|---|
| Group I.—Upper Respiratory System | Group III.—Skin and Mucous Surfaces |
| Measles | Erysipelas |
| Chickenpox | Syphilis |
| Mumps | Gonorrhea |
| Pertussis | Impetigo |
| Scarlet fever | Tularemia |
| Diphtheria | Scabies |
| Poliomyelitis | Ringworm |
| Meningococcic infection | Leprosy |
| Colds | |
| Pneumonia | |
| Smallpox | Group IV.—Intermediary Vectors |
| "Streptococcus throat" | Yellow fever |
| Encephalitis | Plague |
| German measles | Malaria |
| Influenza | Relapsing fever |
| Tuberculosis | Typhoid |
| | Dengue |
| Group II.—Gastro-Intestinal Tract | Typhus |
| Typhoid | Rocky Mountain spotted fever |
| Paratyphoid | |
| Dysentery | |
| Undulant fever | |
| Cholera | |

example, in the case of malaria it would seem obviously better to clean up the mosquito-breeding areas than to attempt to give all persons daily doses of quinine. Economic conditions of the individual are important as well as those of the community, particularly in the case of diseases such as typhus and relapsing fever, the vectors of which may be eradicated by improved personal hygiene.

The diseases in group III present conditions somewhat more difficult to control, as here the personal element becomes increasingly operative. Yet for these diseases there is a general mechanism of prevention, which can be achieved partly by education and partly by improved economic conditions: namely, avoidance of intimate contact and increase in individual cleanliness. The present widespread discussion of venereal disease fostered by the Surgeon General of the United States Public Health Service represents an important educational advance in this

field. The outcome of the fight against venereal disease would appear to depend on the extent to which education of the individual can overcome human nature.

Prevention of the diseases in group I is still more difficult. Modern modes of life are especially conducive to the spread of infection of the respiratory tract from one person to another. Failure to have had the nonrecurring diseases in this group, either in clinically recognizable or in subclinical form, is the exception among urban populations. Thus far, community health measures have completely failed to control the diseases. Isolation of patients, quarantine of contacts and reporting of diseases have had no influence, nor has hospitalization been effective in reducing the prevalence of any of the commoner communicable diseases. When active individual immunization is available, as in the case of smallpox, diphtheria and possibly scarlet fever and pertussis, the disease may be controlled; but in the case of diseases for which there is no active immunization, new technic derived from one of the three methods of interrupting communicable diseases must be worked out. When such methods are developed, they may be applied on a community basis; but until then, further advances in the control of communicable diseases would appear to be problems, first, for the laboratory, and second, for critical circumscribed clinical trial.

Omitting a discussion of (1) methods of increasing nonspecific resistance and (2) the present status of active and passive specific immunization against various diseases transmitted through the respiratory tract, we shall consider methods of controlling these diseases through interrupting the spread of the infecting agent.

The efficacy of current methods of interrupting the spread of infective agents which enter the body through the respiratory tract might be well appraised in a survey of results in a circumscribed area, such as a hospital. One should note when undertaking such a survey that great progress has been made since the beginning of the present century in control of hospital infections and that morbidity and mortality from secondary infection in hospitalized infants have shown a drop paralleling or exceeding the fall in gross infant mortality in the community at large. The purpose of a study such as the present one is not to minimize the great achievements in this field but to determine the magnitude of the unfinished task.

## THE PROBLEM

Reports on the subject of hospital infections are not numerous in recent years in the American literature, but discussions particularly in England and in the Scandinavian countries indicate no lack of appreciation of this problem.

The Sixth Northern Pediatric Congress, meeting in Stockholm, Sweden, in 1934,[1] discussed in some detail the problem of hospital infection and published data which are largely in accord with our own. Frölich [1a] found that in certain institutions as many as 50 per cent of the patients acquired cross infections; small infants and tuberculous and diabetic patients were especially susceptible. Lichtenstein [1b] remarked on the magnitude of the problem and asserted that cubicle isolation of patients and masking of the staff were effective measures. In his opinion, dysentery alone of the enteric infections presented a problem. Lövegren [1c] pointed out the greater exposure to infection of infants in hospitals and recommended small units with homelike atmosphere. He stated that no ward should contain more than 20 beds. Cubicles closed on all sides were used by him for patients recently admitted, and open cubicles, for those of long residence. Open air treatment played a great part in preventing infections, even under unfavorable climatic conditions.

In the general discussion, Ernberg [1g] recommended masks, cubicles, exclusion of visitors, control of nurses' health and administration of cold vaccine to nurses. Jundell [1h] described cellophane tents for patients, which, he said, would prevent the spread even of measles and chickenpox. Yelppö [1i] suggested the employment of older nurses, who would not themselves be predisposed to catarrhal infection. There seemed to be general agreement with Heerup's statement [1d] that well defined epidemic diseases do not present so serious a problem as catarrhal infections of the respiratory tract.

Nassau,[2] who had been studying an orphanage, expressed the opinion that the drop in morbidity and in mortality was due to improvement in nutrition and in general hygiene, including prevention of psychologic inanition. He stated that prevention of contagious diseases was not satisfactorily achieved, that acute infections of the respiratory tract and diseases of the skin were the most difficult to control and that enteric infections presented no great problem.

1. (*a*) Frölich, T.: Infections nosocomiales dans les crèches et hôpitaux pour enfants, Acta pædiat. (supp. 1) **17**:18, 1935. (*b*) Lichtenstein, A.: Nosocomial Infections in Children's Hospitals and Institutions: One Means for Combating These Infections, ibid. **17**:36, 1935. (*c*) Lövegren, E.: Infection Risks in Nursing Institutions for Infants and Young Children and Measures for Their Prevention, ibid. **17**:50, 1935. (*d*) Heerup, L.: Toxaemia tonsillo-pulmonalis fulminans infantum, ibid. **17**:56, 1935. (*e*) Poulsen, V.: Ueber das heutige Auftreten der nosocomialen Infektionen an Kinderkrankenhäusern, insbesondere in Bezug auf die Häufigkeit und die Infektionswege, ibid. **17**:24, 1935, (*f*) Gyllenswärd, C.: Anti-Catarrhal Vaccination in Homes for Children Under School Age, ibid. **17**:78, 1935. (*g*) Ernberg, H., in discussion on Gyllenswärd,[1f] p. 98. (*h*) Jundell, I., in discussion on Gyllenswärd,[1f] p. 102. (*i*) Yelppö, A., in discussion on Gyllenswärd,[1f] p. 101.

2. Nassau, E.: On the Morbidity in a Closed Orphanage and the Possibility of Its Control, Ztschr. f. Kinderh. **52**:67, 1932.

Among the studies in this country have been that of Brennemann [3] and Blatt [3a] on general hospital infection and the reports of Schwartz [4] and Hill [4a] on the dangers of hospitalization of children with infantile eczema.

## INFECTIONS IN AN INFANTS' HOSPITAL

In an effort to throw light on some phases of the problem, we made a survey of the infections arising among patients in an infants' hospital during the years 1935 and 1936, collecting data from carefully reviewed hospital records. The Infants' Hospital was selected because it represented the type of hospital construction and has been operated with the

Fig. 1.—General view of the infants' ward. The data analyzed concern hospital infections in this ward in the years 1935 and 1936.

technic generally thought to prevent the spread of infections. The structure and activities of the ward are illustrated in figure 1. The patients, all under 2 years of age, were confined to their beds, which eliminated patient to patient contact. Each patient was in a cubicle

3. Brennemann, J., and Meyer, H. F.: The Infant Ward, Am. J. Dis. Child. **43**:577 (March) 1932.

3a. Blatt, M. L.: Cross Infection: Its Prevention in a Children's Hospital, Illinois M. J. **70**:483, 1936.

4. Schwartz, A. B.: The Institutional Mortality and Morbidity of Infantile Eczema, J. Pediat. **2**:169, 1933.

4a. Hill, L. W.: Chronic Atopic Eczema (Neurodermatitis) in Childhood, J. A. M. A. **103**:1430 (Nov. 10) 1934.

6 feet (1.8 meters) wide, the partitions of which extended 8 feet upward from the floor but not to the ceiling. Individual gown technic was practiced by all members of the medical and nursing staff. Individual bathtubs, thermometers and other articles were kept in each cubicle.

Under these conditions, 185, or 12.6 per cent, of the 1,455 infants admitted to the hospital in 1935 and 1936 had febrile disturbances which developed while they were in the wards. Many of these infections were definitely not recognizably present when the patients were admitted, appearing sufficiently long after hospitalization to justify the assumption that they had been acquired in the hospital. Cases in which antecedent febrile conditions flared up during hospitalization were excluded, so far

TABLE 2.—*Infectious Diseases Present in Patients on Admission to Hospital*

| | | |
|---|---|---|
| Infection of upper respiratory tract | 478 | |
| Bronchitis and pneumonia | 428 | |
| Sepsis: | | |
| Streptococcus | 33 | |
| Staphylococcus | 7 | |
| Pneumococcus | 17 | |
| Colon bacillus | 12 | |
| Tuberculosis (pulmonary and miliary) | 16 | |
| Meningitis: | | |
| Meningococcus | 11 | |
| Influenza bacillus | 17 | |
| Other organisms | 9 | |
| Acute nutritional disturbance | 201 | |
| Bacillary dysentery | 8 | |
| Measles | 3 | |
| Chickenpox | 1 | |
| German measles | 3 | |
| Poliomyelitis | 23 | |
| Roseola infantum | 12 | |
| Vaccinia | 1 | |
| Diphtheria | 1 | (carrier) |
| Pertussis | 2 | |

as possible. Cases in which the infections were not noted clinically but were demonstrable at necropsy were excluded. In addition, all cases were excluded in which pyrexia was of very short duration or was due to physical agents, such as diagnostic or therapeutic procedures. Also omitted were any cases in which reasonable doubt existed as to the possible origin of the fever.

With the exception of 1 case of pertussis, no contagious disease was represented among these infections. Much has been written and said regarding the dangers of infection in the ward with the so-called contagious diseases, probably because the epidemiology of these diseases cannot be overlooked. It would seem, however, that methods used for control of contagious diseases are more adequate than those used for control of other, less readily traceable infections; that the appearance of the contagious disease leads to such radical temporary improvement in the technic used in the ward that cross infection is reduced; or that

the incidence of contagious diseases in the hospital studied by us was too small to be reflected in secondary cases.

In table 2 are shown the infections observed in patients on their admission to the hospital during the two year period. These, together with illnesses or carrier states among the staff and among the visitors to the ward, represent the infections to which the patients in the ward might have been exposed. It becomes apparent that acute contagious diseases were not a source of trouble but that the 906 cases of acute infections of the respiratory tract (including pneumonia) presented the greatest potential source of infection for the other infants in the ward. This is reflected in the finding that of the 185 disturbances which developed while the patients were in the hospital, 134, or 59.8

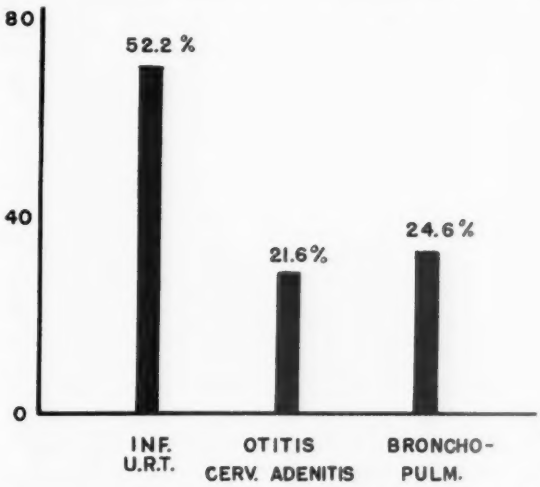


Fig. 2.—Infections of the respiratory tract which developed in the hospital, distributed according to type of involvement.

per cent, were acute infections of the respiratory tract, while the next largest group, consisting of infections of the skin, amounted to only 15.6 per cent of all secondary disorders. Distribution of infections of the respiratory tract according to type is shown in figure 2. Acute nutritional disturbances arising in the hospital amounted to 9.5 per cent of the acute secondary processes. It is noteworthy that there were no cross infections with the dysentery group of organisms.

In figure 3 is shown distribution of patients by age, and the number and percentages of each age group who contracted secondary infections. The slightly greater extent to which infants under 1 year of age were affected may reflect the fact that the younger patients were handled more often. The findings are charted to yield information of two types: (1) the actual number and percentage of the whole group of 1,455

patients in each age group and (2) the number and percentage of the 185 children (12.6 per cent of the 1,455) who acquired infections. In figure 3 the number of patients in each category is shown in the solid columns, while the number of hospital infections in each category is shown in the cross-hatched columns. The percentage at the top of each solid column indicates the relation of that age group to the total number of patients admitted. The percentage at the top of the cross-hatched column gives the percentage of the infections as related to the total number of hospital infections. The percentage beneath each two columns represents the relation of the cross-hatched to the solid column, or the percentage of each age group who acquired infections.

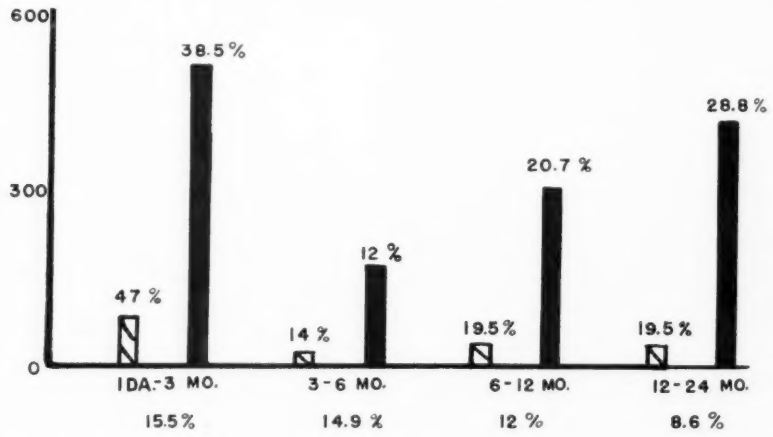


Fig. 3.—Incidence of hospital infections according to the ages of the patients. The solid columns represent the number of patients in each age group; the percentage beneath each two columns shows the relation of cross infections in each age group to the total number of patients in that group. At the top of each cross-hatched column is the percentage of total hospital infections in each age group. Thus secondary illness developed in 15.5 per cent of the infants under 3 months of age; these illnesses comprised 47 per cent of the total infections.

A point of considerable importance is distribution of infections according to length of residence in the hospital. In figure 4 is shown the period of hospitalization of the patients and the number and percentage of each group who acquired infections. It is noteworthy that 89.7 per cent of all hospital infections occurred in children who had remained in the ward more than two weeks, and that 26.6 per cent of all children who were in the wards longer than two weeks acquired infections. If these data are computed on an annual basis, the average number of febrile illnesses for each patient in the hospital is more than five. A critic of such data might ask how this finding would compare with findings on the health of the same patients under home conditions.

Would not the infants have had as many or more infections in the home? While no accurate data are available on this subject, it is recognized that chances of exposure to infection are much greater in the hospital than in the home; but this is counterbalanced by isolation, which is enforced only in the hospital. The question is not whether infants are more liable to infection in hospitals than in the home, but whether in the controlled, circumscribed area of a hospital a technic can be developed which, despite the greater dangers of exposure, will prevent infection, and whether parts of this technic may be applicable in the public health control of these disorders.

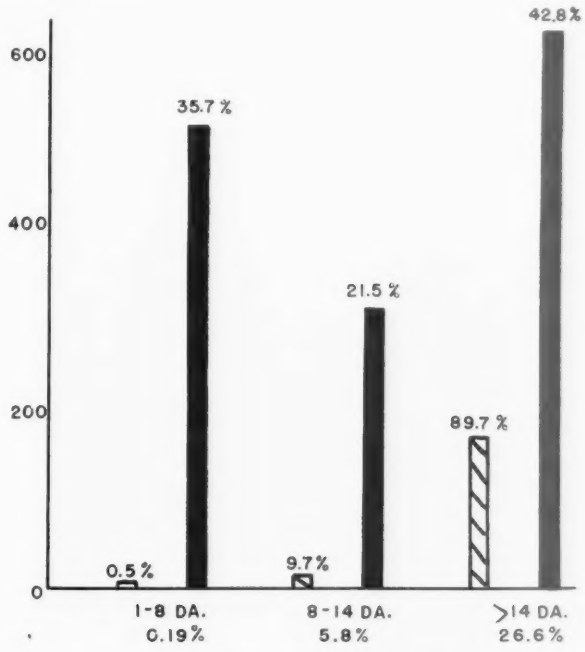


Fig. 4.—Relation of the duration of hospitalization to the development of secondary infections. Of all secondary disturbances, 89.7 per cent occurred after two weeks of residence in the hospital. A secondary disturbance developed in 26.6 per cent of all patients who remained longer than two weeks.

The effect of the general health of the patient prior to hospitalization is shown in figure 5. Of 810 children previously normal, who were suffering only from acute processes when admitted, 5.5 per cent acquired infections in the hospital, whereas 19.3 per cent of 114 babies born prematurely, 35.6 per cent of 149 chronically malnourished infants and 17.1 per cent of 382 congenitally defective infants became infected. Duration of stay in the hospital was here a related factor, as the infants who were born prematurely and those who were malnourished or con-

genitally defective constituted the group who remained longest in the institution. Under the heading chronic malnutrition were grouped patients with vitamin deficiencies. Patients with scurvy and with non-specific types of severe malnutrition showed a high incidence of secondary disturbances. Patients with rickets were little more susceptible to secondary infections than were children who had been well previously.

One cannot escape the presumption that the greater susceptibility of children who are malnourished, prematurely born or defective may be in part related to lowered resistance due to unrecognized specific deficiencies.

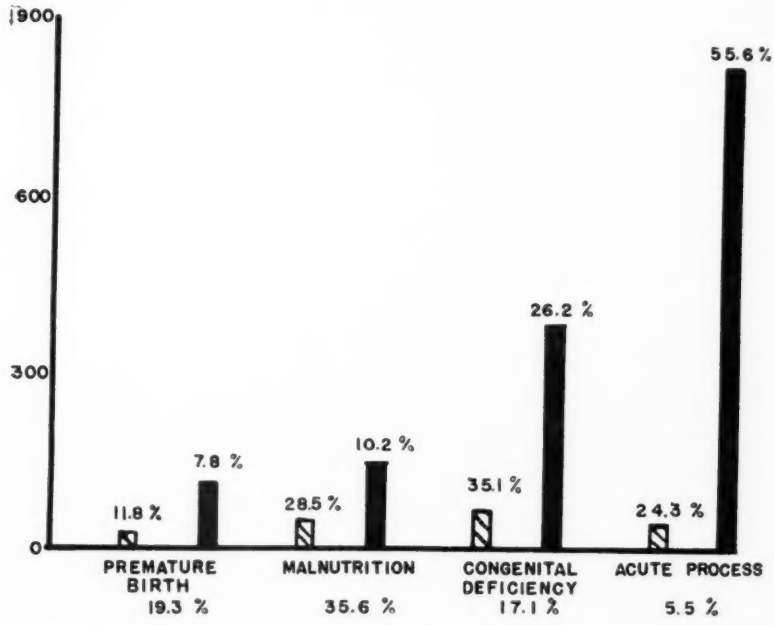


Fig. 5.—Relation of the general health of the patient at entry to the incidence of hospital infections.

The distribution of hospital infections according to severity showed that 42 infections were severe, 66 were of moderate severity and 116 were of mild febrile type. There were 22 deaths due apparently to infections developing in the hospital; of the children who died, 4 were born prematurely, 7 were malnourished and 11 were congenitally debilitated. Sixty-nine and six-tenths per cent of these patients were infants under 3 months of age, which indicated that the danger of hospital infection is greater for very young infants. The hospital infections were scattered throughout the year but occurred in greatest numbers in March and April and in August and September.

Our careful exclusion of cases in which there were known to be antecedent active or latent infections leads to the conclusion that the hospital infections were accomplished through (1) *transmission of organisms by the hospital personnel* or (2) *transmission by air.* The possibility that diseases are transmitted by members of the attendant medical or nursing staff has led to the development of the present widely practiced isolation technic. Although different degrees of isolation have been achieved by variation in the details of the technic and although undoubtedly numerous slips have occurred in the carrying out of the most carefully planned procedure, it would seem that the frequent occurrence of hospital infection must be due to mechanical inadequacies of the cubicle system or to actual neglect of necessary principles or omission of necessary actions on the part of the staff.

### AIR-BORNE INFECTION

Knoepfelmacher [5] in 1928, in discussing control of contagious diseases in a hospital, stated that the organism of varicella seems to be air-borne, as this disease spreads despite the isolation of patients in cubicles and the use of masks by the ward personnel. He attempted to prevent the spread of varicella by securing separate ventilation for each closed cubicle and by exhausting the air from these cubicles to the outside. Pirquet [6] devised a type of closed cubicle, which has been introduced into this country by Schick and Karelitz.[7] This cubicle achieves much in preventing transmission of infections by the personnel, but it is hardly adequate to prevent air-borne infection.

Harries,[8] in discussing control of infections in a children's ward, pointed out that bacterial infections of the upper respiratory tract were less readily transmitted than virus diseases. He asserted that close contact is necessary for the spread of scarlet fever, diphtheria and whooping cough, whereas colds, influenza, measles, and chickenpox spread rapidly. He stated that inadequate precautions have been taken in the treatment of patients with colds, otitis and pneumonia and concluded that closed cubicles would seem desirable for them as well as for patients with measles or chickenpox. Debré,[9] discussing prevention of contagious diseases, admitted that no way has been found for the

5. Knoepfelmacher, W.: House Infections in the Isolation Station, Monatschr. f. Kinderh. **42**:318, 1928.

6. Pirquet, Clemens: Isolierbetten, Ztschr. f. d. ges. Krankenhausw. **24**: 741 (Dec. 17) 1928.

7. Schick, Béla, and Karelitz, Samuel: Pirquet Cubicles for Infants, J. A. M. A. **108**:1684 (May 15) 1937.

8. Harries, E. H. R.: Infection and Its Control in Children's Ward, Lancet **2**:173 (July 27) 1935.

9. Debré, R.: Infections Acquired in Children's Hospitals: Need for Special Service, Bull. Acad. de méd., Paris **116**:194, 1936.

control of influenza and infections of the upper respiratory tract. The Academy of Pediatrics,[10] in a round table discussion of infections of the upper respiratory tract, recognized the magnitude of the problem but presented no solution.

Armand-Delille [11] and his collaborators ascertained that even closed cubicles with incomplete partitions are inadequate to prevent certain types of cross infection, particularly measles, and that infection takes place through the passage of organisms above the cubicle wall into the adjacent cubicle; they concluded that at least patients with measles and chickenpox should be put into individual rooms.

Allison and Brown [12] identified streptococci infecting the air of a scarlet fever ward as of the type harbored by the patients. During the night the number of organisms was smallest; in the morning, the number rose rapidly, to decline somewhat in midafternoon, according to the degree of activity of patients and attendants in the ward.

O'Kell and Elliott [13] pointed out the dangers of cross infection in wards for patients with diseases of the ear and throat. A careful epidemiologic study was made, and transfer of infections from patient to patient was proved by bacteriologic methods. These authors suggested the possibility of air-borne infection. Garrod [14] cultured pathogenic organisms from the air of otorhinologic wards and expressed surprise that patients with septic respiratory tracts and those with clean otorhinologic disorders have so long been housed in the same ward.

The studies of Wells [15] have contributed most to a scientific consideration of the problem of infection by air-borne organisms; they have

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10. Proceedings of the American Academy of Pediatrics, J. Pediat. **4**:693, 1934.

11. Armand-Delille, P. F.; Lestocquay, C., and Herrenschmidt, J. L.: Hospital Contagion in Medical Children's Wards with Cubicle Isolation, Bull. Acad. de méd., Paris **115**:29, 1936.

12. Allison, V. D., and Brown, W. A.: Reinfection as a Cause of Complications and Relapse in Scarlet Fever Wards, J. Hyg. **37**:153, 1937.

13. O'Kell, C. C., and Elliott, S. D.: Cross Infection with Hemolytic Streptococci in Oto-Rhinological Wards, Lancet **2**:836, 1936.

14. Garrod, L. P.: Cross Infections in Oto-Rhinological Wards, Lancet **2**: 946, 1936.

15. Wells, W. F.: On Air-Borne Infection: I. Apparatus for the Study of the Bacterial Behavior of Air, Am. J. Pub. Health **23**:58, 1933; Droplets and Droplet Nuclei, Am. J. Hyg. **20**:611, 1934. Wells, W. F., and Stone, W. R.: Air-Borne Infection: Viability of Droplet Nuclei Infection, ibid. **20**:619, 1934. Wells, W. F., and Brown, H. W.: Recovery of Influenza Virus Suspended in Air and Its Destruction by Ultraviolet Light, ibid. **24**:407, 1936. Wells, W. F., and Fair, G. M.: Viability of B. Coli Exposed to Ultraviolet Radiation in Air, Science **82**:280, 1935. Wells, W. F., and Wells, M. W.: Air-Borne Infection, J. A. M. A. **107**:1698 (Nov. 21); 1805 (Nov. 28) 1936.

tended to reverse the older ideas of the distance to which infectious material may be borne by the air. Wells has ascertained that droplets do not all fall to the floor in the vicinity of the patient but may dry and become what he calls droplet nuclei, which, as he has shown by ingenious experiments, may remain in the air for hours. Haemophilus influenzae died in one hour when sprayed into the air, but staphylococci, pneumonococci, streptococci and diphtheria bacilli remained viable for several days. Although difficulties in the experimental technic prevented equally extensive investigations of virus activity, it was established that the influenza virus remained in the air up to one hour. The air of a medical classroom was heavily infected with nasopharyngeal organisms; in this hospital the air of the waiting room of the outpatient department as well as the air of an infants' ward (the ward from which were obtained the data already cited) contained large numbers of pathogenic and nonpathogenic organisms. Under present conditions patients in hospitals, children in schools and adults in theaters, street cars and other crowded areas are inhaling one another's nasopharyngeal flora, as once they ingested one another's intestinal flora in water and food.

The efficacy of ultraviolet radiation in sterilizing air was investigated independently by Wells [15] and by Hart.[16] Hart reported favorably on sterilization of the air in operating rooms by this means. Effectiveness of ultraviolet radiation appears to depend on: (1) the type of organism, not all organisms being equally susceptible to the rays; (2) the distance of the organisms from the lamp; (3) the velocity of passage of the organisms through the rays, and (4) the character of the source of radiation.

Measurements of bacterial contamination of the air of the outpatient department of a children's hospital and of the wards of an infants' hospital were made by Wells. After demonstration of the amount of bacterial contamination of the air, a therapeutic ultraviolet lamp was set up in the outpatient clinic of the hospital in an effort to decrease the number of bacteria present. The efficacy of the lamp in actual use under these circumstances was disappointing. Further, with certain types of lamp the accumulation of ozone became noticeable and led to complaints of headache and nausea from the personnel. Certain newer lamps said to have equal bactericidal effect do not produce ozone.

During the winter of 1936-1937, while the data recorded earlier were being collected in the infants' ward, a pair of lamps were set up in the

16. Hart, Deryl: Sterilization of the Air in the Operating Room by Special Bactericidal Radiant Energy, J. Thoracic Surg. **6**:45, 1936. Hart, Deryl, and Gardner, C. E., Jr.: Sterilization of the Air in the Operative Region with Bactericidal Radiant Energy, Tr. South. S. A. **49**:377, 1937.

corridor of the isolation ward in order that it might be determined whether the spread of chickenpox could be prevented in actual practice.

The isolation unit differed in construction from the infants' ward in that there were closed rooms for each patient rather than cubicles, and each room had separate outside ventilation, the unit fulfilling in mechanical arrangement the most stringent requirements for individual

Fig. 6.—Corridor of the isolation ward. Separate rooms with individual outside ventilation provide a maximum of mechanical isolation. On the wooden frame are mounted four ultraviolet lamps, making a barrier of ultraviolet radiation across the corridor.

isolation (fig. 6). Since it was opened, in 1931, there had been no cross infections in this unit, except with chickenpox and measles. Measles was subsequently controlled by the use of convalescent serum or of placental extract, but chickenpox continued to present a problem.

A barrier of ultraviolet radiation was set up across the corridor in order to eliminate, if possible, transmission of the chickenpox virus

by air. In preliminary tests performed with the assistance of Mr. Wells, the barrier was shown to be adequate to prevent the spread of colon bacilli sprayed into the air (fig. 7), except when gusts of

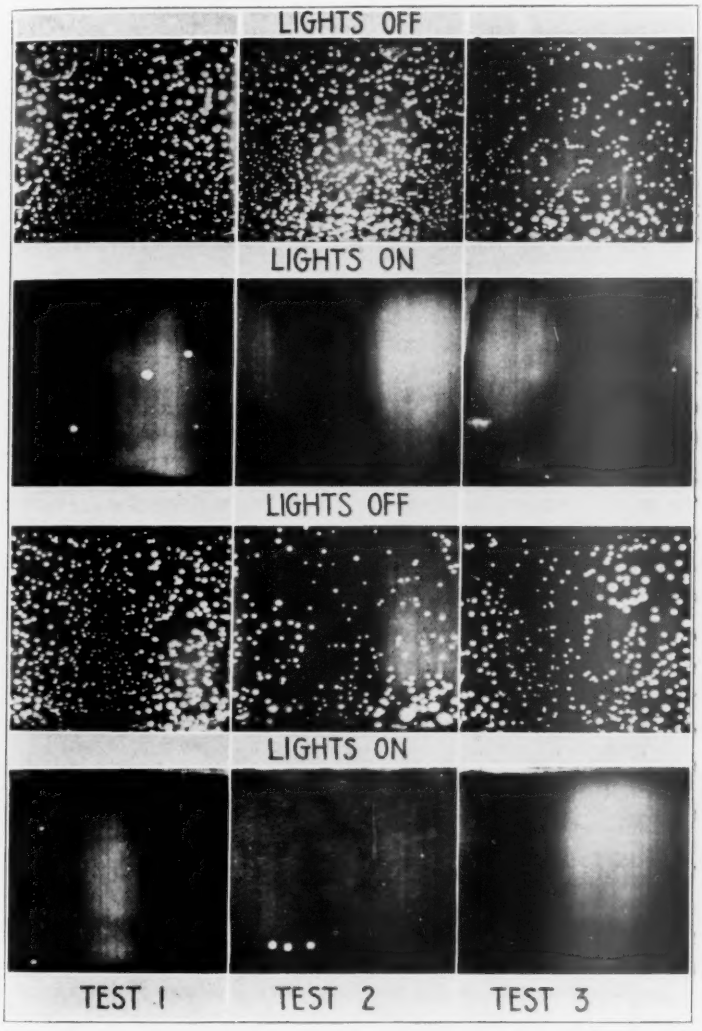


Fig. 7.—Effect of ultraviolet radiation on organisms sprayed into the air on one side of the lamp barrier and collected from the air 10 feet (3 meters) away, on the other side of the barrier, the lamps being alternately turned off and on.

wind were allowed to sweep past the lamps. In order to control somewhat the current of air, an exhaust fan was placed in the window at the end of the corridor which traversed the section in which patients with

chickenpox were kept. This maintained a slow motion of air toward the chickenpox area rather than away from it.

In all, 12 patients with chickenpox were kept in the ward throughout the duration of their illness. For a period of five months the section for patients with chickenpox, who were separated from the rest of the patients by the barrier of ultraviolet radiation, contained patients with active involvement. Unfortunately, the record of prevention of cross infection did not remain clear; one of the 120 children beyond the barrier acquired chickenpox. The cross infection could hardly be blamed on failure of the lamps, as it could be traced directly to a nurse who herself came down with the disease. This one case represented less cross infection than had occurred in previous years, but its occurrence was evidence that isolation technic was still inadequate.

The failure of the ultraviolet lamps to reduce adequately the amount of infectious material in the air of a clinical waiting room indicated certain technical difficulties; namely, they could not sterilize air far removed from them, and further, they could not be placed close enough to patients to prevent expulsion of bacteria into the air. They had to be so placed that the radiation did not reach the eyes of the patients or of the ward personnel. However, they did sterilize the air near them, thus serving to dilute the infected air of the room with sterile air. It would seem that these technical difficulties are not insuperable and that ultraviolet radiation deserves further trial as an added mechanical means of diminishing air-borne infection. However, in hospital practice sterilization of the air, although it may minimize this type of infection, cannot obviate the human element in the transfer of disease, i. e., the transmission of organisms on the clothes, on the hands or in the nasopharyngeal secretions of the attendants.

### THE EFFICACY OF MASKS

The personnel of a hospital will not transmit disease by clothing which is covered by gowns or by hands which are carefully scrubbed before and after care of each patient. But protection of patients against direct expulsion of the nasopharyngeal organisms of the attendants has not been effected by use of ultraviolet radiation or by current methods of isolation. The surgeon considers that masking is a necessary part of his technic if the expulsion of organisms from the nose and mouth into the open wound is to be prevented, but the general physician often has failed to consider the effect on debilitated children of exposing them to the nasopharyngeal flora of a large and changing personnel. A careful bacteriologic study is now under way in this laboratory, the purpose being to determine the amount and character of the seeding of

the nasopharynges of infants by organisms which are carried in the air of the wards or transmitted by the attendants.

The use of masks, which has been recommended by Ernberg, Sauer, Knoepfelmacher, Blatt and others, apparently should not be casually cast aside with the statement: "Surely the idea that protection is derived from masks has been exploded long ago." If surgeons and obstetricians are correct in their attitude, the subject of masking should be reconsidered not only in children's and infants' hospitals but among practicing pediatricians. However, the adequacy of the mask must be viewed with skepticism.[17] Years ago it was pointed out that multiple layers of gauze, even up to 10 or 12, as used in the ordinary commercially obtainable mask, were entirely inadequate to prevent the transmission of droplet infection;[17] yet doctors and nurses suffering from acute infections of the respiratory tract don such masks and continue their work with a sense of complete security.

Reference to the surgical literature shows that masks of two basic types have been constructed and used: (1) a filtering and absorbing mask, made of gauze or other material through which the wearer breathes, and (2) an impervious mask, which deflects the air expelled from the nose and throat, exhausting it behind the wearer. The efficacy of various types of masks in protecting against direct expulsion of organisms is shown in figure 8. In these tests, Petri plates protected by the mask under investigation were exposed to the spray of a bacterial culture from an atomizer set at varying distances up to 18 inches

17. Doust, B. S., and Lyon, A. B.: Face Mask in Infection of Respiratory Tract, J. A. M. A. **71**:1216 (Oct. 12) 1918. Dannenberg, A. M.: A Simple Face Mask for Use by Contagious Disease Attendants, ibid. **70**:990 (April 16) 1918. Weaver, G. H.: The Value of the Face Mask and Other Measures, ibid. **70**: 76, (Jan. 12) 1918; Droplet Infection and Its Prevention by the Face Mask, J. Infect. Dis. **24**:218, 1919. Leete, H. M.: Some Experiments on Masks, Lancet **1**:392, 1919. Kellogg, W. H., and McMillen, G.: An Experimental Study of the Efficiency of Gauze Face Masks, Am. J. Pub. Health **10**:34, 1920. Meleney, F. L., and Stevens, F. A.: Postoperative Hemolytic Streptococcus Wound Infections and Their Relation to Hemolytic Streptococcus Carriers Among the Operating Personnel, Surg., Gynec. & Obst. **43**:338, 1926. Meleney, F. L.: Seasonal Incidence of Hemolytic Streptococcus in Nose and Throat, J. A. M. A. **88**:1392, 1927. Walker, I. J.: How Can We Determine the Efficiency of the Surgical Mask? Surg., Gynec. & Obst. **50**:266, 1930. Mellinger, H. V.: A New Mask That Protects Both Physician and Patient, J. A. M. A. **95**:662 (Aug. 30) 1930. Hunt, E. L.: Some Further Observations upon Contamination of Operative Wounds (Air-Borne Bacteria), New England J. Med. **209**:931, 1933. Blatt, M. L., and Dale, M. L.: A Bacteriological Study of the Efficiency of Face Masks, Surg., Gynec. & Obst. **57**:363, 1933. Davis, J. S.: The Importance of Adequate Masking During Operations, Ann. Surg. **100**:1008, 1934. Waters, E. G.: Adequate Surgical Masking: Problem and Solution, Am. J. Surg. **32**:474, 1936.

(46 cm.) from the mask. The amount of deflection was studied by exposure of similar plates to a divided section of the blast from the atomizer, the deflecting agent being the mask under investigation. By these simple experiments the relative filtration, absorption and deflection of the bacteria in the current of air could be detected. Tests made while the masks were in actual use were carried out over a period of hours, to determine (1) the length of time the mask remained effective and (2) the degree of comfort of the wearer. Obviously, a

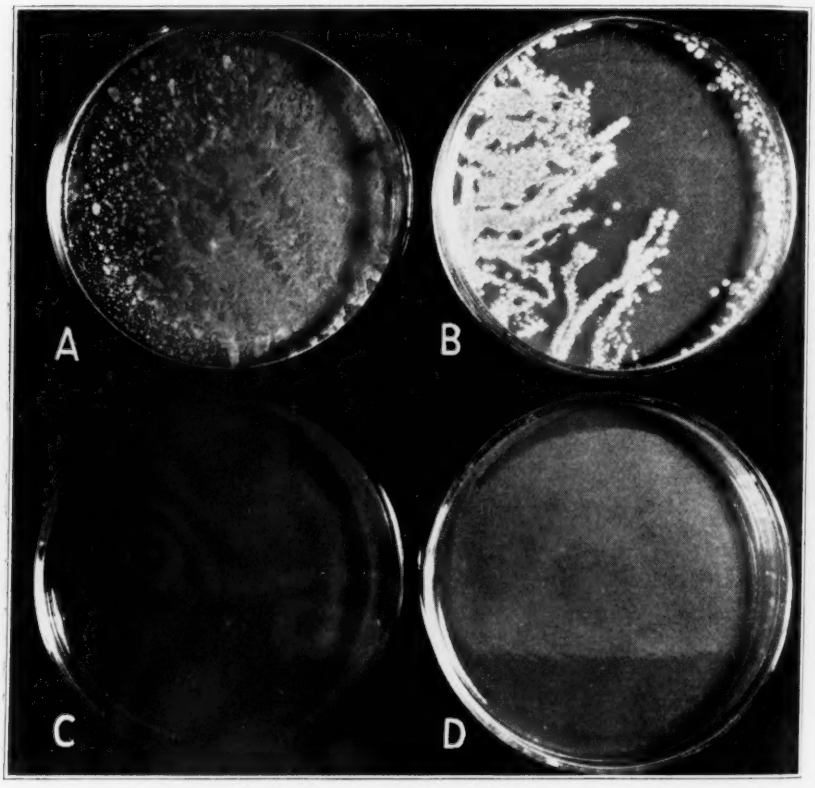


Fig. 8.—Effectiveness of masks in stopping transmission of organisms sprayed from a distance of 18 inches (46 cm.). The organisms are staphylococci obtained from the laboratory staff (nasopharynx). *A*, a control, no mask used, shows the amount of seeding on an agar plate sprayed with organisms from an atomizer at a distance of 18½ inches (47 cm.). *B*, a plate protected by a commercial gauze mask, shows the amount of seeding of an agar plate when a mask intervenes between the spray and the plate. The mask was placed directly over the plate, 18 inches from the source of the spray. *C*, a plate protected by the same mask with a filler of compressed cotton. *D*, a plate protected by a mask of soft paper similar to paper toweling. The effect of cellophane masks is not illustrated, as they are impervious to air and are of deflecting type only.

mask which entirely deflected the current of air prevented direct expulsion of organisms into the face of the neighboring person, but it did not stop contamination of the air.

The most nearly effective filtering and absorbing mask which we have tested is one which contains a layer of cotton between layers of gauze. Filtering masks of gauze with heavy cotton fillers, such as have been adopted by the Boston Lying-In Hospital, are hot and

Fig. 9.—Different types of mask in use. *A*, no mask. *B*, gauze mask with cotton filler, a satisfactory filter. *C*, paper mask, which protects against large droplets but not against deflected minute droplets. *D*, plastic mask, impervious to air, which prevents direct infection but does not protect against minute deflected droplets.

difficult to breath through, but until thoroughly wet they effectively prevent transmission of microscopically visible organisms. Whether they are effective against viruses has not been determined. However, these masks seem to contain an unnecessarily thick layer of cotton. It is remarkable how effectively a thin layer of *compressed* cotton trans-

forms a worthless gauze mask into an effective bacterial filter. We have tested a mask with a filler of compressed cotton, which may be renewed after the gauze has been washed, and have found it to be satisfactory and inexpensive. Deflecting masks have been made of cellophane and of heavier cellulose plastics. An inexpensive and relatively satisfactory mask which combines absorption and deflection has been made of paper; in action it is similar to the gauze mask which contains a sheet of rubber or of cellophane. Paper masks may be used freely, if discarded before they become wet through; they should be satisfactory for most medical purposes. Such masks, made of paper similar to paper toweling, are already in use in certain clinics (fig. 9).

Ultraviolet radiation, which dilutes the contaminated air with sterilized air, can result in only partial sterilization of the air in any enclosed space, while the patients, by coughing, by sneezing or even by quiet breathing, are constantly adding to the contamination. Further, ultraviolet radiation cannot prevent transfer of nasopharyngeal organisms from personnel to patient.

The use of masks has been deprecated because they fail completely to stop cross infections. However, according to various estimates they have been from 50 to 75 per cent effective.[17] Recognition that neither masks alone nor ultraviolet radiation alone can be entirely effective should lead to more careful appraisal of these two agencies used conjointly in the development of a more adequate isolation technic.

## SUMMARY AND CONCLUSIONS

At present, the problem of cross infection in an infants' hospital is not so much a question of controlling gastro-intestinal and so-called contagious diseases as one of preventing acute infections of the respiratory tract and certain ailments of the skin.

Duration of hospitalization has been found to influence greatly the incidence of infections. Premature, malnourished or chronically ill infants suffered most. Patients with eczema, cerebral deficiency or congenital anomalies were also bad hospital risks. Infants who had been well up to the development of the acute condition which led to hospitalization suffered little from secondary infections.

The present analysis, in accord with results in the literature, indicates that despite great improvement in the methods of hospital isolation, there may still be major flaws in the technic now used in institutions caring for infants.

Clinical observations on the possible air transmission of measles, chickenpox and acute infections of the respiratory tract in the light of the work of Wells, Hart and others indicate that air-borne infections may play a larger role than is generally recognized.

From our experience and from a review of the literature certain tangible procedures and directional efforts may be derived:

1. Hospitalization of infants should be employed only when necessary, and no infant should be kept in the hospital longer than his condition demands.

2. The susceptibility of children who are born prematurely, or are malnourished, chronically ill, eczematous, syphilitic or mentally defective to acute infections raises grave question as to the wisdom of placing such patients in wards with acutely ill infants or having them cared for by nurses who are also attending infants with acute infectious diseases, notably infections of the skin and of the respiratory tract.

3. In any hospital ward for infants each patient should be in a separate cubicle. Open cubicles, with walls not reaching to the ceiling, are less satisfactory than cubicles with walls extending to the ceiling: these in turn are less effective than separate rooms with individual outside ventilation.

4. The efficacy of ultraviolet radiation in sterilizing the air of wards should be subjected to more extensive trial.

5. Adequate masks of filtering or deflective type should be worn by all attendants. The usual gauze mask is not adequate. Under certain conditions, gauze masks with cotton fillers or masks of paper or of cellophane are adequate.

NOTE.—The discussion which followed the presentation of this paper appeared in the report of the transactions of the Chicago Pediatric Society (AM. J. DIS. CHILD. **55:** 220 [Jan.] 1938).

# News and Comment

## COMING MEETINGS

Meetings of the following organizations will be held in the near future at Atlantic City, N. J.:

American Laryngological, Rhinological and Otological Society, Inc., April 27, 28 and 29.
American Bronchoscopic Society, April 30
American Laryngological Association, May 2, 3 and 4
Congress of American Physicians and Surgeons, May 3 and 4
American Otological Society, May 5 and 6

## DEATHS

Dr. Luis Calvo Mackenna, of Santiago, Chile, died on Dec. 2, 1937. Dr. Mackenna, who was one of the best known of Chilean pediatricians, was especially interested in preventive pediatrics. His loss will be greatly felt among Latin-American countries, but especially in Chile, for he contributed largely to the furtherance of child welfare in that country.

## GENERAL

**American Board of Pediatrics.**—Examinations will be held by the American Board of Pediatrics on May 3 and 4 in New York, and on June 12 in San Francisco.

# Obituaries

## FREDERIC TRUBY KING, M.D.
### 1858-1938

Dr. Frederic Truby King died in Wellington, New Zealand, on February 9. Dr. King was born in 1858 at New Plymouth, New Zealand. His long life of eighty years was filled with activity in the cause of saving children's lives. He was created a knight in 1925, and many other honors were given him by his own and foreign governments. Among them was his election as an honorary member of the American Pediatric Society. In 1907 he founded the Royal New Zealand Society for the Health of Women and Children, known as the Plunket Society, and he was lent by the government of New Zealand to organize the Babies Hospital and Mothers' Training Center in England. His publications were largely directed toward public health and toward education of the laity, in which fields he was eminently successful.

With the death of Dr. Truby King there comes to an end a career filled with usefulness not only to his own government but to the entire world. His enthusiasm and genial nature, his unbounding energy and his practical ability will be sadly missed.

# Abstracts from Current Literature

## Biochemistry; Bacteriology, and Pathology

A Strain of B. Botulinus Not Classified as Type A, B or C. H. Sobotka, E. Witebsky, E. Neter and E. S. Schwarz, J. Infect. Dis. **60**:257 (May-June) 1937.

The article embodies the results of a bacteriologic examination of canned sprats imported from Germany and reported to have caused botulism in three persons, one of whom died.

A gram-positive spore-forming bacillus was recovered from anaerobic cultures of the fish incubated at from 25 to 30 C. The Berkefeld filtrates of the fish extracts and filtrates of broth cultures of the bacillus produced symptoms of botulism in guinea pigs, rabbits and mice. The toxins in both types of filtrates were found to be immunologically identical.

The toxin produced was not neutralized by Bacillus botulinus monovalent antitoxic serums, types A, B or C, and the antiserum produced against this toxin did not neutralize the B. botulinus toxins, types A, B, C alpha or C beta.

Significant differences and similarities between the culture isolated from the German canned sprats and representative strains of B. botulinus, types A, B and C, are discussed. The toxigenic type to which the culture belongs has yet to be determined.

Toomey, Cleveland.

Bactericidal Action of Pectin. E. Haynes, C. A. Tompkins, G. Washburn and M. Winters, Proc. Soc. Exper. Biol. & Med. **36**:839 (June) 1937.

Two per cent pectin added to heart infusion broth in which Escherichia coli was grown in vitro inhibited the growth. Aqueous solutions of pectin gave very satisfactory results in the treatment of osteomyelitis and other deep as well as superficial types of wounds. An aqueous solution of pectin seems to be nonirritating and apparently stimulates the growth of granulative tissue. In cultures there was a marked decrease in streptococcic growth and a more gradual decrease in the growth of staphylococci.

Hansen, Minneapolis.

## Metabolism; Infant Feeding; Milk and Other Foods

Meeting the Requirements for Proper Nutrition in Infancy. John G. Young, Texas State J. Med. **32**:531 (Dec.) 1936.

The author reviews the requirements for proper nutrition in infants in regard to calories, proteins and fluids. He gives a logical method of fulfilling these requirements for normal infants. He emphasizes the desirability of figuring out the correct formula for the whole twenty-four hours, thereby allowing great flexibility in determining the amount and frequency of feeding. He also gives his own schedule of the times at which extra vitamins are necessary and the ages at which various solid foods should be given for the first time.

Moore, Dallas, Texas.

Copper in Human Breast Milk and in the Milks of Certain Animals. Lesné, Zizine and Briskas, Bull. Soc. de pédiat. de Paris **34**:569, 1936.

Human milk is richer in copper than the milks of the cow, goat and ass. The greatest amount occurs in colostrum and in milk taken during the first weeks

of lactation. After this the amount diminishes, especially after the eighth month. There is a seasonal variation in the copper content of animals' milks, more marked in the cow and in the goat. There is very little variation in the milk of the ass. These milks all contain more copper in the spring and summer and less in the winter. This is probably due to diet, as the copper in young shoots and leaves of plants has been found higher than that in similar older growths.

BENJAMIN, Montreal.

PROBLEMS OF METABOLISM IN TOXIC NUTRITIONAL DISTURBANCES: A PRELIMINARY COMMUNICATION. Z. M. DINERSHTEYN, S. M. AZENBERG and E. N. TROYANOVSKAYA, Vrach. delo **19**:1085 (Dec.) 1936.

The authors present data obtained from their study of the metabolism of protein, chloride and dextrose in the course of toxic nutritional disturbances. The observations were carried out on ten infants with toxic nutritional disturbances and thirteen puppies with experimental toxicosis.

The authors' conclusions are as follows: 1. In infants suffering from toxic nutritional disturbances and in animals with experimental toxicosis there are similar changes in the protein metabolism; this is expressed in an increase in the nitrogen of the blood, in the total as well as in the residual nitrogen. 2. The changes in the blood sugar in infant intoxications as well as in experimental toxicosis showed no regularity. 3. The concentration of blood chloride was increased in the experimental form of toxicosis.

BODER, Los Angeles.

## Vitamins; Avitaminoses

STUDIES ON THE URINARY EXCRETION AND BLOOD CONCENTRATION OF ASCORBIC ACID IN INFANTILE SCURVY. T. H. INGALLS, J. Pediat. **10**:577 (May) 1937.

The excretion of cevitamic acid in the urine and the concentration of this acid in the blood plasma were studied in seven infants who were proved to have scurvy. Absolute depletion of cevitamic acid in the urine and great lowering of the levels in the plasma (from 0.15 to 0 mg. per hundred cubic centimeters) were found. Increase in the cevitamic acid excreted in the urine and elevation of the level in the plasma depended on the dose of cevitamic acid employed in treatment. The greater the dose the more rapid the replenishment of the vitamin. These results suggest that there are zones in the excretion of cevitamic acid in the urine which are generally characteristic of frank scurvy, asymptomatic scurvy and suboptimal and optimal intake of vitamin C. Further, it appears that recovery from frank scurvy depends on the quantitative replenishment of cevitamic acid in the tissues through stages of absolute and then relative depletion until an adequate depot has been attained.

Ingalls believes that greater emphasis should be given the quantitative aspect of cevitamic acid in nutrition in the prevention and in the treatment of scurvy. Approximately 1,000 mg., or the equivalent of 2 liters of orange juice, was required to affect perceptibly the absolute urinary depletion in these patients. Each infant required 2,000 mg. before partial saturation of the tissues was obtained. Further study is required to determine the minimal protective dose of cevitamic acid for human beings. The amount needed for normal growth and function in infancy is estimated to lie between 15 and 30 mg. per day, and there is suggestive evidence in the literature, as well as in two of the author's cases, of an increased metabolic demand for cevitamic acid during certain morbid states.

The studies on the plasma level of cevitamic acid in three groups of infants (well babies, babies picked at random from the ward, and patients with scurvy) demonstrated levels characteristic of optimal, suboptimal and deficient intake of vitamin C.

RAUH, Cincinnati.

A Comparative Study in the Diagnosis and Treatment of Rickets with Observations of the Normal and Abnormal Serum Phosphatase. D. J. Barnes and M. D. Carpenter, J. Pediat. **10**:596 (May) 1937.

Barnes and Carpenter made physical and roentgenologic examination of 187 infants with clinical signs of active rickets and histories of a low intake or no intake of vitamin D and made determinations of the serum calcium, phosphorus and phosphatase. Using a level of 4 mg. of phosphorus as indicative of active rickets, they found agreement between the level of serum phosphorus and the clinical findings in only 19.8 per cent of these children and agreement between roentgenologic and clinical findings in only 26.7 per cent. If serum phosphatase levels of between 6 and 12.5 mg. per cubic centimeter are accepted as normal for infants, there was agreement between clinical findings and serum phosphatase in 65.2 per cent of those who actually presented rickets. The serum phosphatase level appeared to offer an excellent measure of rachitic activity, and repeated determinations during treatment gave an indication of the rate and progress of healing.

The optimal dosage of vitamin D necessary to bring about the more rapid fall in serum phosphatase to normal and clinical improvement of the patient was found to be 800 Steenbock units (2,160 U. S. P. X. [revised 1934] units) over a period of from one and a half to two months. In children in whom secondary anemia was severe, treatment of the anemia along with administration of vitamin D hastened recovery from rickets.

Rauh, Cincinnati.

Interpretation of X-Ray Films in the Diagnosis of Rickets. T. B. Cooley and L. Reynolds, J. Pediat. **10**:743 (June) 1937.

Roentgenograms of forty-three infants who were thought at some period to show roentgenologic evidence of rickets were read by a competent group of pediatricians and roentgenologists and the interpretations compared. There was practically no disagreement in interpretations in those cases in which the changes were severe enough to be of clinical importance, and the differences in the films considered as showing "mild" or "moderate" rickets were chiefly a matter of individual terminology. There was, however, a conflict of opinion as to the presence or absence of evidence of rickets in individual films. Such difference of opinion indicates a lack of generally recognized criteria or standards for the determination of minor degrees of the rachitic process. The matter is of importance in that roentgenologic readings are quite generally accepted as decisive in research on the preventive or curative value of various foods and drugs. The authors feel the necessity for studies to establish standards which would be more accurate and convincing.

Rauh, Cincinnati.

Calcium and Phosphorus Studies: XIII. The Effect of Emulsification on the Potency of Viosterol in the Treatment of Rickets in Children. D. H. Shelling, J. Pediat. **10**:748 (June) 1937.

Experiments were carried out to determine the efficacy of an emulsified viosterol in milk as against viosterol in oil. At first a lecithin-water emulsion of viosterol, miscible in water and milk, was added to the daily formula. This was abandoned because the vitamin slowly deteriorated on standing in the water solution. Thereafter the vitamin was emulsified in malt extract, or it was "homogenized" directly with evaporated milk just before canning. The vitamin D in these preparations was found to be stable at room temperature after one year. Each can of the evaporated milk, equal to a quart (946 cc.) of whole milk, contained 400 international (U. S. P. XI) units of the vitamin. The experiments were carried out on three groups of rachitic infants. The degree of rickets and the progress of healing were determined roentgenologically, and in some instances determinations were made of the calcium, phosphorus and phosphatase in the serum before and

after the administration of the vitamin preparation. The results were compared with those observed previously in rachitic children treated with viosterol alone. This comparison showed that the addition of viosterol to milk in the manner described enhances the efficacy of the viosterol in curing moderate and severe rickets about tenfold. Shelling believes that the increased potency of the emulsified vitamin D in milk is due to the small particle size of the lipoids in which the vitamin is carried, which probably makes it more easily absorbed from the gastro-intestinal tract. Milk rendered antirachitic by direct irradiation or by feeding vitamin D to the cow is similarly enhanced, owing probably to the reduction in size of the lipoids carrying the vitamin.

RAUH, Cincinnati.

THE DEVELOPMENT OF RICKETS IN THE CANTONS OF COLMAR AND ANDOLSHEIM. A. ZILLHARDT, Bull. Soc. de pédiat. de Paris **34**:373 (June) 1936.

In Colmar, of 265 children examined in one year, 40 per cent were found to have some evidence of rickets. Roughly a third of these had rickets that would be placed in three categories labeled mild, moderate and severe. In Andolsheim, of 192 children examined in 1934, 45 per cent had rickets, which was mostly mild or moderate; in only 13 children was the condition severe. The percentages for urban and rural districts were approximately the same. The number of cases of rickets is high, but the proportion in the severe category is much less when compared with the great number in this category observed ten years ago. Breast feeding did not appear to prevent the development of mild and moderate rickets, but only 6 breast fed infants with severe rickets were observed in the cities, and only 1 in the country. The criteria by which a diagnosis of rickets was made are not mentioned.

BENJAMIN, Montreal.

RICKETS IN SCHOOLS. M. FREYSS, Bull. Soc. de pédiat. de Paris **34**:374 (June) 1936.

After forty years of experience Freyss reports a higher percentage of rickets in boys than in girls. He believes that heredity plays some role in the incidence of rickets. He does not think the general condition of the children has anything to do with the incidence or that syphilis is a factor, but he firmly asserts that poor housing conditions predispose children to it. He has observed late rickets in older children who have anorexia, nervousness and anemia. There is no mention of the criteria by which a diagnosis of rickets was made.

BENJAMIN, Montreal.

ORTHOPEDIC TREATMENT OF RICKETS. E. ALLENBACH, Bull. Soc. de pédiat. de Paris **34**:377 (June) 1936.

For mild deformities due to rickets no orthopedic treatment may be necessary. For more marked deformities early treatment is advised, as usually osteoclasis suffices to obtain correction, whereas at a later period osteotomy is frequently required. By early treatment epiphysial deformities and articular disturbances are prevented.

BENJAMIN, Montreal.

ORTHOPEDIC TREATMENT OF RACHITIC DEFORMITIES. M. MEYER and P. BRANZEN, Bull. Soc. de pédiat. de Paris **34**:378 (June) 1936.

Spontaneous recovery from rachitic deformity may occur as a result of a proper antirachitic regimen, but marked deformity does not entirely disappear, and for this condition orthopedic treatment is indicated at an early period. The course of the disease is divided into three periods: (1) that of active development of the condition, (2) that when deformities appear as a result of standing or walking or strong muscular action and (3) that when reconstruction and straightening of the bones takes place. There is general agreement that treatment of spinal deformities should be instituted as soon as these are observed, but as regards treatment

of deformities of the lower extremities, some advise waiting until all active rickets has subsided, while others recommend early intervention. The latter point of view is favored, with immediate institution of proper diet, actinotherapy and viosterol. Osteoclasis is generally sufficient to correct the deformity at an early stage, whereas at a later stage open operation frequently becomes necessary.

BENJAMIN, Montreal.

ASPECTS OF THE PROBLEM OF THE VITAMINS WHICH ARE OF SCIENTIFIC AND PRACTICAL INTEREST. C. A. RAGAZZI, Omnia med. **15**:309 (May-June) 1937.

Ragazzi reviews recent developments in the field of the vitamins.

HIGGINS, Boston.

PREGNANCY AND HYPOVITAMINOSES OF INTESTINAL ORIGIN. G. GAEHTGENS, Wien. klin. Wchnschr. **16**:444 (March 27) 1937.

Gaehtgens points out that it has been proved by others that the vitamin C requirements of the pregnant organism are increased. The fetus takes its cevitamic acid requirements from the maternal organism, which in turn extracts its requirements from the food. If the food does not supply adequate amounts, the maternal organism will show signs of vitamin C deficiency. If the development of hypoavitaminotic conditions is to be avoided during pregnancy, it is necessary to exclude all exogenic and endogenic factors that are likely to increase further the already great cevitamic acid requirements. A deficiency of cevitamic acid in the food is an exogenic factor, and all those conditions which prevent the proper utilization of the vitamin are endogenic factors. The author gives especial attention to the latter, particularly to disturbances in the gastro-intestinal function. He reports the clinical history of a pregnant woman, aged 31, in whom ulcerous colitis developed with a severe deficiency of vitamin C. He emphasizes that whenever gastro-intestinal disturbances occur in the course of pregnancy it is necessary to supply the maternal organism with large quantities of vitamins by parenteral administration.

ABT, Chicago.

## Prematurity and Congenital Deformities

ORAL ADMINISTRATION OF OESTRIN TO PREMATURE BABIES. M. F. POTTER, Brit. M. J. **1**:1201 (June 12) 1937.

Following her already reported use of subcutaneous injections of estrogenic substance in the treatment of premature babies, Potter gave estrin by mouth. In feeding this substance to mice she had found that it acted as well given orally as when injected, although a larger dose was necessary. The preparation used was dihydrotheelin benzoate (the benzoate of 3, 17-dihydroxy-1, 3, 5-estratriene). It is thought that all of the infants treated with this preparation gained more readily than had those previously treated without it. No deaths occurred in a series of eleven infants. [It is worthy of note, however, that the smallest baby weighed 3 pounds and 8 ounces (1,533 Gm.) and the largest 5 pounds and 3½ ounces (2,367 Gm).—Abstractor.]

ROYSTER, University, Va.

ABNORMALITIES OF GROWTH AND DEVELOPMENT: THE CLINICAL AND PATHOLOGICAL ASPECTS. H. GARDINER-HILL, Brit. M. J. **1**:1241 (June 19) 1937.

This is one of two articles representing the Oliver-Sharpey Lectures delivered before the Royal College of Physicians of London on March 16 and March 18, 1937, which are published in different numbers of the *British Medical Journal*—a scholarly summation of the knowledge, theories and suppositions concerning normal and abnormal growth. Consideration is given to the differential growth by periods and to the supposed influence of heredity, sex and environment (racial

aspects not considered). Particular attention is paid to cartilaginous development and growth due to the influence of the glands of internal secretion, particularly as regards accelerated growth and retarded growth. The influence of the various glands of internal secretion is reviewed in brief from the standpoint of stimulation of growth—particularly the direction of growth—and also from the standpoint of the retardation. This includes the pituitary, the thyroid, the thymus, the gonadotropic hormones and the pineal gland. Diet is considered, emphasis being placed on the variety and the total quantity. Factors that limit growth are also considered. Then there is a discussion of gigantism, acromegaly, macrosomia and precocious puberty. The juvenile adrenogenital syndrome is considered at some length.

An abstract of the second article, which I think should be considered along with this, follows.

ROYSTER, University, Va.

ABNORMALITIES OF GROWTH AND DEVELOPMENT: THE CLINICAL AND PATHOLOGICAL ASPECTS. H. GARDINER-HILL, Brit. M. J. **1**:1302 (June 26) 1937.

In the second part of his address Gardiner-Hill takes up arrested or retarded development and the history of dwarfism and infantalism. The terms are defined as follows:

Simple Dwarfism:

1. Simple hereditary dwarfism.
2. Simple dwarfism due to developmental skeletal disease: (*a*) achondroplasia, chondro-osteodystrophy and dyschondroplasis; (*b*) osteogenesis imperfecta.
3. Simple dwarfism due to acquired skeletal disease: (*a*) simple rickets and late rickets; (*b*) spinal caries and spinal deformities due to other causes—for example, poliomyelitis.
4. Hypergonadal dwarfism.

Dwarfism and Infantilism:

1. Cachectic.
2. Cachectic infantilism associated with more specific changes at the growth cartilages: (*a*) congenital syphilis; (*b*) scurvy; (*c*) celiac rickets; (*d*) renal dwarfism.
3. Endocrine: (*a*) hypopituitary; (*b*) hypothyroidic; (*c*) hypogonadal.

A brief description of each of these types is then furnished with a statement of the etiology so far as it is known. Most of this statement of the etiology is based on work which has been done by various investigators. Theories not yet proved are discussed and outlined in a brief fashion, with surmises and deductions which are lucid, inviting a reading in their entirety. A good bibliography is appended.

ROYSTER, University, Va.

MULTIPLE CONGENITAL DEFORMITIES: HAND WITH FIVE FINGERS WITHOUT THUMB. É. PICHON and S. WIRZ, Bull. Soc. de pédiat. de Paris **34**:310, 1936.

A 2 month old boy had an imperforate anus, a large umbilical hernia, a Klippel-Feil syndrome and hands each of which showed five fingers with three phalanges each but no thumb.

BENJAMIN, Montreal.

ROENTGEN STUDY OF MIDLINE FISTULAS IN THE NECK. E. RUCKENSTEINER, Fortschr. a. d. Geb. d. Röntgenstrahlen **54**:321 (Sept.) 1936.

Ruckensteiner discusses the embryologic basis for thyroglossal duct fistula. In suitable cases the fistula may be studied advantageously by means of a contrast medium. Two relevant cases are described.

MCCUNE, New York.

A Case of Congenital Aplasia of the Left Side of the Diaphragm. A. Anzilotti, Röntgenpraxis **8**:666 (Oct.) 1936.

Anzilotti reports a case of diaphragmatic hernia and briefly reviews the clinical aspects thereof. The brief bibliography contains only one reference that is not easily accessible to American readers.

McCune, New York.

## New-Born

Care of the Skin of the Newborn Infant: A Six-Year Study of Thirty-Five Hundred Newborn Infants. H. N. Sanford, J. Pediat. **11**:68 (July) 1937.

Statistics on the incidence of skin lesions in infants in the neonatal period of life are unreliable chiefly because of failure to define exactly what is meant by "skin lesions" and because of difference in terminology. Sanford's report covers a study of skin lesions and of care of the skin in new-born infants over a period of six years. He classifies the lesions in three groups: (1) irritations—erythematous macules and papules (erythema toxicum) and all forms of intertrigo; (2) pustules—all vesicles and pustules, so-called benign pustulosis, impetigo and pemphigus neonatorum; (3) pustules with exfoliation—dermatitis exfoliativa. No case of this occurred in the entire series. During the period of study seven different methods of care of the skin were used. Each method except the first was tried for a period of one year. The first method used was that of anointing the baby's skin with 2 per cent ammoniated mercury ointment at birth and then giving daily baths with soap and water. The nursing care during this period was of the central type. The following year the nursing technic was changed. Three nurseries were established, one for normal babies, one for babies with minor irritations of the skin and one for babies with severe lesions of the skin. The care of the skin was the same as outlined. The third method used was the substitution of olive oil baths for the baths with soap and water. The following year no antiseptic was used at birth, but the use of olive oil was continued. Next a commercial oil was used, and then a mixture of olive oil and mineral oil was tried. The sixth year the skin was left untouched for nine days after removal of excess blood immediately after birth. After the ninth day daily oil baths were given. The results showed that the greatest reduction in incidence of lesions of the skin resulted from improvement in the technic of nursing and isolation and leaving the skin untouched for nine days. When this method was in use only 10 per cent of the infants showed cutaneous irritations and only one baby a pustule.

Rauh, Cincinnati.

Nuclear Jaundice in Neonatal (Umbilical) Sepsis with Jaundice. A. Biemond and S. van Creveld, Arch. Dis. Childhood **12**:173 (June) 1937.

This is a clinical and pathologic description of two cases of septic jaundice of the new-born (umbilical infection) combined with nuclear jaundice, giving rise to an extrapyramidal neurologic syndrome.

From the literature it must be concluded that nuclear jaundice is frequent in icterus gravis neonatorum but exceptional in neonatal sepsis with jaundice. To explain this fact, it may be noted that symptoms of hypoplasia of the corpus callosum and fornices were present in both these cases. This must be explained as due to a disturbance in development. It is a well known fact that in a brain which shows a disturbance in development the function of the barrier between the blood and the cerebrospinal fluid is insufficient. Perhaps this may explain why in these cases nuclear jaundice developed. A similar state of affairs is seen in the frequent occurrence of encephalitis in infants whose brains are congenitally malformed.

Kelly, Milwaukee.

FAT NECROSIS OF THE NEW-BORN. J. J. BINDSCHEDLER and EUGUY, Bull. Soc. de pédiat. de Paris **34**:391, 1936.

A new-born infant who had been subjected to massage and slapping of the back because of asphyxia began to show numerous areas of fat necrosis two weeks after birth. The condition cleared up gradually in the usual manner.

BENJAMIN, Montreal.

CHYLOTHORAX IN A NEW-BORN INFANT. H. JANET, E. BŒGNER and MME. LAQUERRIÈRE, Bull. Soc. de pédiat. de Paris **34**:577, 1936.

A boy 1 month old showed dyspnea and cyanosis abruptly. He had had milder similar spells since birth. Physical signs and roentgenologic evidence of fluid in the right half of the thorax were obtained, and 250 cc. of milky fluid was aspirated. This was followed by complete recovery, and the child was in good health three years later. The etiology of the condition was not determined, but it is felt that slight trauma occurring at birth or postnatally might account for it.

BENJAMIN, Montreal.

ETIOLOGY OF GONOBLENNORRHEA NEONATORUM: REPORT OF A CASE. E. JOHANSSON, Klin. Monatsbl. f. Augenh. **97**:775 (Dec.) 1936.

Three days after birth an infant had rhinitis, with a watery discharge, which became purulent a few days later, when difficulty of nasal breathing developed and traces of blood appeared in the nasal discharge. On the fourteenth day the lids were slightly swollen, and a conjunctival discharge was noted. On the sixteenth day gonoblennorrhea neonatorum with chemosis was evident in each eye. Gonococci were present in the conjunctival and nasal discharge. Solution of silver nitrate had been properly instilled after the method of Kredé. This case suggests the necessity of considering not only diphtheria and syphilis but also gonorrhea as a cause of rhinitis in the new-born. Even stomatitis gonorrhoeica has been observed, due probably to gonorrheal conjunctivitis. Johansson suggests following Kredé's treatment with the use of less irritating preparations in every case of maternal gonorrheal vaginitis, so as to avoid late infections of the type described.

STOLL, Cincinnati. [ARCH. OPHTH.]

INFLUENCE OF PREGNANCY IN INTRACRANIAL HEMORRHAGES IN THE NEW-BORN. E. HVAL, Norsk mag. f. lægevidensk **98**:816, 1937.

The cerebrum was examined in twenty-six cases in which the child either was stillborn or lived only a short time after birth. After intracranial fixation of the cerebrum a histologic examination was made of samples from different parts.

The frequency and distribution of hemorrhages were compared in the premature and the full term infant and in the infant born after a normal pregnancy and the one born after a pathologic pregnancy. The results of the investigation showed that cerebral hemorrhages are larger and occur more frequently in infants born of mothers following pathologic pregnancy compared with infants born of mothers following normal pregnancy.

Hval confirms the findings from ten years' material published two years ago in *Acta pædiatrica* from the same department by K. U. Toverud, who also found that a pathologic pregnancy disposed the infant to cerebral hemorrhages.

The practical consequence of this finding is the necessity of systematic control of pregnant women so as to prevent the intoxications which are mentioned with particularly frequency in the anamnestic data on mothers of children with cerebral hemorrhages.

TOVERUD, Oslo, Norway.

## Acute Contagious Diseases

DETAILED STUDY OF DIPHTHERIA IMMUNIZATION. H. H. PANSING and E. R. SHAFFER, Am. J. Pub. Health **26**:786 (Aug.) 1936.

Approximately 85 per cent of 462 school children with positive reactions to the Schick test gave negative reactions sixty days after injection of 1 cc. of alum-precipitated toxoid. In a similar group of 495 children, 86 per cent gave negative reactions sixty days after injection of 1 cc. of alum-precipitated toxoid. Of the 549 children in these groups who had negative reactions at sixty days, 57.8 per cent had positive reactions at the end of two years. The authors feel that immunization with a single dose of alum-precipitated toxoid is unreliable.

McBRYDE, Durham, N. C.

IMMEDIATE ALLERGIC RESPONSE FOLLOWING A SCHICK TEST. A. E. KELLER and S. HARRIS JR., Am. J. Pub. Health **26**:809 (Aug.) 1936.

Two cases of an immediate allergic reaction following the Shick test are reported. The reactions occurred in young adults four and one-half months and ten months after injection of alum-precipitated toxoid. In both these persons the Schick test had been made several times. These reactions were typical of the immediate allergic reaction of moderate severity and were relieved by subcutaneous injections of epinephrine hydrochloride. No late reaction occurred. It is felt that they were due to hypersensitiveness following injection of alum-precipitated toxoid.

McBRYDE, Durham, N. C.

MYELOPATHY FOLLOWING VACCINATION. CLARENCE W. OLSEN and KENNETH H. ABBOTT, Bull. Los Angeles Neurol. Soc. **2**:34 (March) 1937.

Olsen and Abbott report the case of a man aged 36 who, after primary vaccination in March 1929, suffered from severe vaccinia, with a temperature of 104 F. for a week, and numbness and weakness of the lower extremities. The weakness disappeared quickly, but the numbness persisted. He continued at work until June 1931, after which there was gradual development of further sensory loss in the lower extremities, with progressive weakness and cramping in the legs, disturbances of sphincter and fatigability. Examination revealed irregular, sluggish pupils and increased tendon reflexes, with ankle clonus and pathologic reflexes. The patient became unable to walk in November 1934, and in September 1936 reexamination revealed complete spastic paraplegia, dribbling of urine, pathologic reflexes on both sides, absence of abdominal and cremasteric reflexes and sensory impairment below the twelfth dorsal dermatome. Vibration and position sense were absent in the lower extremities. Spinal puncture revealed normal serologic and dynamic findings, except for a cell count of 13 per cubic millimeter and some increase in globulin. Slight improvement followed this examination, but in November 1936 the lower extremities showed atrophy without fibrillation and reduction of the tendon reflexes. Olsen and Abbott think that the onset of the disease was clinically distinctive of a form of postvaccinal encephalomyelitis but admit that the subsequent course was more in keeping with a diagnosis of acute disseminated encephalomyelitis precipitated by vaccinia.

MACKAY, Chicago. [ARCH. NEUROL. & PSYCHIAT.]

THE IMMUNOLOGICAL RESPONSE TO VACCINIA IN GUINEA PIGS. L. DIENES and H. L. NATERMAN, J. Infect. Dis. **60**:279 (May-June) 1937.

Dienes and Naterman state that in order to obtain information concerning the significance of the bacterial type of allergy it should be studied in acute diseases. Vaccinia in guinea-pigs was found to be an acute disease in which typical allergy develops. The skin reactions both grossly and microscopically correspond to tuberculin reactions.

The lesions produced in the skin of guinea-pigs begin to heal on the fourth day after infection. Immunity of the skin becomes noticeable later, on the sixth or seventh day. Antibodies were not found before the twelfth day. The development of allergy and the healing of the lesions before the development of general immunity indicate that healing is the result of an active process of immunization.

In rabbits the development of the tuberculin type of sensitiveness was not observed.

The possible participation of the dermal epithelium in the process of immunization and the similarities and differences of the disease process in man and in guinea-pigs are pointed out.

TOOMEY, Cleveland.

THE OPSONOCYTOPHAGIC TEST IN THE STUDY OF PERTUSSIS. P. KENDRICK, J. GIBBS and M. SPRICK, J. Infect. Dis. **60**:302 (May-June) 1937.

A technic has been described which makes the opsonocytophagic test practicable as a method for studying immune reactions in pertussis.

In a series of children who were given injections of Bacillus pertussis vaccine there was a definite and progressive increase in opsonins during the immunization. Reactions were found to be declining slightly six months after immunization, and they tended to become relatively weaker after one or two years.

During an attack of pertussis, in general, a progressive rise in opsonins was indicated by results up to two months after the onset and then a gradual decline. The reactions, however, were less uniform than in the vaccinated group.

The reactions of infants from 1 day to 1½ years old with no record of an attack were largely negative. With an increase in age more weak to moderate reactions occurred. In the older children, the test does not clearly differentiate those who have had pertussis from those with no record of an attack.

Data are reported which suggest that the opsonocytophagic reaction may afford one more criterion in the comparative study of cultures and of vaccines, thus adding to the information which must be secured before the many problems surrounding pertussis can be solved.

TOOMEY, Cleveland.

EXPERIMENTS ON ACTIVE AND PASSIVE IMMUNITY IN GUINEA-PIGS AGAINST H. PERTUSSIS. J. A. TOOMEY and W. S. TAKACS, J. Infect. Dis. **60**:370 (May-June) 1937.

Under the conditions of the authors' experiments there was no definite evidence that any beneficial effects were conferred on guinea-pigs by active or passive immunization against the "disease producing" phase of Haemophilus pertussis.

TOOMEY, Cleveland.

TREATMENT OF PERTUSSIS WITH SPECIFIC SOLUBLE ANTIGEN. H. GOLD, J. Pediat. **10**:641 (May) 1937.

Twenty-eight children with pertussis in the paroxysmal stage were treated intranasally with a specific soluble antigen. The antigen, prepared by Roos at the Mulford Biological Laboratories of Sharp and Dohme, was made from freshly isolated phase I cultures of Haemophilus pertussis grown on blood agar. The organisms were suspended in buffered physiologic solution of sodium chloride and macerated; the insoluble residue was then separated by centrifugation and the soluble antigenic substances standardized on the basis of complement fixation against specific immune serum. From 5 to 10 drops of this antigen was instilled in the nose daily or every other day, depending on the severity of the symptoms. In two children the antigen was administered subcutaneously. Seventeen of the children responded excellently. In seven others good results were obtained. In one of the children to whom the antigen was given subcutaneously and early in the disease, the paroxysmal stage was avoided. No untoward reactions, local or

systemic, occurred either when the antigen was given intranasally or when it was given subcutaneously. Intranasal administration of the antigen has great appeal, but the author recognizes the uncertainty of absorption because of the presence of such extrinsic elements as mucus in the nose. RAUH, Cincinnati.

USE OF SULPHANILAMIDE (PARA AMINO BENZENE SULPHONAMIDE) IN EXPERIMENTAL POLIOMYELITIS. S. R. KELSON, Proc. Soc. Exper. Biol. & Med. **36**:718 (June) 1937.

The results of experimental studies with monkeys show no therapeutic value of sulphanilamide in experimental poliomyelitis. HANSEN, Minneapolis.

CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES. Pub. Health Rep. **52**:763 (June 11) 1937.

In the period from April 25 to May 22, 1937, measles reached its seasonal peak with 49,418 cases, the lowest for this period in nine years. Influenza showed a decline but was still in excess of that in corresponding periods of the last three years. Smallpox (1,142 cases) was the highest since 1932. Scarlet fever (24,600 cases) was normal. Diphtheria, poliomyelitis, typhoid and meningitis were low. The average mortality from all causes was 11.8 per thousand.

SANFORD, Chicago.

MORBILLI BULLOSI. G. W. RONALDSON, Brit. J. Child. Dis. **34**:99 (April-June) 1937.

The bullous variety of measles is rare. In a series of 4,362 cases of measles only two examples were met.

The literature of morbilli bullosi is reviewed. Ronaldson suggests that some of the cases were very likely not instances of measles. These reported cases can be allocated, he thinks, to one or another of three categories: (*a*) cases in which a bullous eruption was associated with a morbilliform erythema; (*b*) cases in which well authenticated measles was accompanied by an eruption which had pemphigoid elements; (*c*) cases of measles in which a bullous eruption followed the true rash, either immediately or after varying intervals.

LANGMANN, New York.

AN OUTBREAK OF MILK-BORNE SCARLET FEVER AND TONSILLITIS IN DONCASTER. R. WATSON, Brit. M. J. **1**:1189 (June 12) 1937.

This is a very interesting study which may be briefly outlined as follows: An outbreak of scarlet fever and tonsillitis occurred, which was due to infection of a milk supply with Streptococcus pyogenes type II, and administrative action was taken to minimize the effects of the outbreak. The distribution of cases showed a heavy attack among preschool children and also that adults formed a larger proportion than normal of the total number of persons involved. The primary infection of the milk appeared to have come about by the cow's becoming infected, but on the evidence obtainable locally the possibility cannot be entirely disregarded that there was direct contamination of the milk by a milker. The complications subsequent to infection are enumerated, and from this point of view hospital treatment appears to have been of doubtful value except in children under 5 years of age.

The only adequate method of controlling such an outbreak is that of stopping the milk supply or having it efficiently pasteurized.

To avoid a false sense of security in the search for hemolytic streptococci in milk, small group samples should be taken. ROYSTER, University, Va.

VACCINE TREATMENT OF MEASLES. A. A. CUNNINGHAM, Brit. M. J. **1**:1202 (June 12) 1937.

Cunningham used a vaccine which was originally intended for complications of bronchopneumonia, consisting of equal numbers of pneumococci, hemolytic streptococci and Pfeiffer's bacilli. He followed out the work done previously by Wynn. The results from giving the patients injections of this preparation were disappointing. He feels that there is nothing to be gained by the use of this vaccine.

ROYSTER, University, Va.

ERYSIPELAS TREATED WITH PRONTOSIL. G. E. BREEN and I. TAYLOR, Lancet **1**:1334 (June 5) 1937.

Of forty-six erysipelatous patients, thirty-five were treated with a derivative of sulfanilamide (para-aminobenzene sulfonamide base) known as prontosil soluble (the disodium salt of 4'-sulfamidophenyl-2-azo-7-acetylamino-1-hydroxynaphthalene-3, 6-disulfonic acid), administered by mouth. The drug may be expected to produce favorable results in about forty-eight hours, i. e., when about 60 grains (3.88 Gm.) have been ingested. The drug ought to be given for about a week. No untoward effects were noted.

LANGMANN, New York.

USE OF VACCINATION TO SHOW NEED FOR PUBLIC VACCINATION. A. W. WAKIL BEY, J. Egyptian M. A. **20**:237 (June) 1937.

Attributing the occurrence of epidemics of smallpox in Egypt to the waning of immunity from past general vaccinations, the author submitted a sample of the population to revaccination between three and four years after previous vaccination, with the following results:

| | No. | Percentage |
|---|---|---|
| Persons showing typical reactions | 14 | 2.4 |
| Persons showing accelerated reactions | 327 | 54.7 |
| Persons showing immune reactions | 257 | 42 |

He concluded that general vaccination is advisable when more than half of a sample group exhibits accelerated reactions.

MULHERIN, Augusta, Ga.

MENINGITIS FROM MUMPS. A. M. ABRIL and G. CARDELLE, Arch. de méd. inf. **6**:215 (June) 1937.

A typical case is presented. Such cases are rare in Cuba. The condition is benign and subsides spontaneously.

SANFORD, Chicago.

CONVALESCENT SERUMS. J. HUBER, Bull. Soc. de pédiat. de Paris **34**:305, 1936.

A motion was made and unanimously passed by the Society of Pediatrics of Paris that the director of the Administration of Public Assistance be requested to look after the collection of convalescent serums for use in hospitals, and to make arrangements for the payment of donors just as is done for donors of blood for transfusion.

BENJAMIN, Montreal.

MEASLES ENCEPHALITIS OF APOPLECTIC TYPE IN A BOY OF EIGHT YEARS. R. LIÈGE, Bull. Soc. de pédiat. de Paris **34**:338, 1936.

On the fourth day after the onset of measles a boy had convulsions and became comatose. He had myosis and hyperpyrexia. There was no paralysis. He died thirty hours after the beginning of encephalitic symptoms. He had been given a total of 4.2 Gm. of aminopyrine during the course of the illness, but this did not necessarily have any bearing on the development of encephalitis, as the latter occurs in cases in which this drug is not used. Because of its futility in the treatment of measles aminopyrine is not recommended.

BENJAMIN, Montreal.

DEATH FOLLOWING RAPIDLY AFTER INJECTION OF ANATOXIN AND ANTIDIPHTHERITIC SERUM. H. ESCHBACH, Bull. Soc. de pédiat. de Paris **34**:353, 1936.

A boy 12 years old received an injection of anatoxin in the shoulder region and 5 cc. of serum containing 1,000 units of diphtheria antitoxin in the abdominal wall, both subcutaneously. This was done to prevent diphtheria after the boy had been in contact with his older brother, who it was believed had the disease, although the latter had previously had injections of anatoxin. Five minutes after the injections the boy began to show marked anaphylactic symptoms, and fifteen minutes after the injections he died, despite an intracardiac injection of epinephrine hydrochloride. He had never manifested any evidence of eczema or asthma, and these were the first injections he had ever received. The older brother, who received an injection at the same time, showed no reaction to the serum.

BENJAMIN, Montreal.

VARICELLA FOLLOWING REPEATED ATTACKS OF HERPES ZOSTER. FRITZ WERNER, Dermat. Wchnschr. **73**:204 (May) 1936.

An 8 year old girl had three attacks of herpes zoster, all involving the inner surface of the lower third of the left leg. Ten days after the last attack typical varicella developed. Werner concludes that the virus of herpes zoster cannot be the same as that of varicella.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

COMBINATION OF SCARLET FEVER AND DIPHTHERIA. F. J. LÖTZ, Kinderärztl. Praxis **8**:189 (May) 1937.

Lötz confirms the observations of others that scarlet fever and diphtheria occur together rather frequently. The differential diagnosis between "scarlet diphtheroid" and true diphtheria is difficult, sometimes even impossible. Scarlet fever and diphtheria do not influence each other. Lötz never observed toxic diphtheria in patients suffering from scarlet fever, although toxic diphtheria has not been infrequent in Germany in the past eight years. He states that diphtheria bacilli are often found in the pus in otitis media with scarlet fever, without clinical evidence that the otitis is diphtheritic.

HEYMANN, Cleveland.

TREATMENT OF CIRCULATORY DISTURBANCES IN DIPHTHERIA. H. ZISCHINSKY, München. med. Wchnschr. **83**:1824 (Nov. 6) 1936.

Zischinsky discusses at length the treatment of cardiovascular disturbances in diphtheria. He calls attention to the early injury to the blood vessels, which may be sufficiently severe to cause death during the first few days of the disease. When the cardiovascular damage has been extensive and the patient is critically ill, phenobarbital and morphine are used for sedation. Zischinsky has not seen any beneficial results following the use of caffeine, strychnine, camphor or epinephrine. The rapid changes in blood pressure resulting from the administration of epinephrine throw an extra burden on an already weakened heart muscle. The exhibition of preparations of adrenal cortex and cevitamic acid failed to improve the circulatory disturbances. Electrocardiographic changes following large doses of digitalis are similar to those in toxic diphtheria. Both affect the conduction system. For this reason Zischinsky used digitalis only in cases in which there was edema of the skin or transudates. In such cases the prognosis is poor and the conduction mechanism is not severely injured. Another drug which was not effective is squill. In fact, Zischinsky found no reliable treatment for the circulatory disturbances in diphtheria, and this was not surprising in view of the anatomic damage which occurred in some cases. He advises rest, the administration of fluids and the use of p-methyl-amino-ethanol-phenol tartrate.

BRAHDY, Mt. Vernon, N. Y.

THERAPY TO SUPPORT THE CIRCULATION IN SEVERE DIPHTHERIA. H. MÜLLER, München. med. Wchnschr. **84**:924 (June 11) 1937.

Death during the first few days of diphtheria is caused by generalized toxemia. The toxemia produces, among other pathologic changes, relaxation of the peripheral blood vessels and fall in blood pressure. The pulse rate is rapid in relation to the fever and returns to normal only after two or three weeks, if there is no myocarditis. An electrocardiogram made during the first week is usually normal. Apparently the injury is primarily vascular. Müller tried various medicaments to improve the circulation at this stage and found that only those which improve the tonus of the blood vessels were efficacious.

In severe diphtheria there is subsequent injury to the heart itself. Early symptoms indicating myocardial damage are anorexia, defective pulse, less distinct heart sounds, increase in the area of cardiac dulness, cyanosis and cold extremities. Slight myocardial changes may be detected only in the electrocardiogram. At this stage the digitalis and strophanthus group of drugs are indicated, even though there is the possibility of heart block. Absolute rest is essential in all cases.

BRAHDY, Mt. Vernon, N. Y.

LESIONS OF THE CENTRAL NERVOUS SYSTEM IN THE COURSE OF EPIDEMIC PAROTITIS IN CHILDREN. E. M. KAPLAN and E. L. ROUBASHEVA, Vrach. delo **19**:301 (April) 1937.

The authors present the clinical picture and course of epidemic parotitis, complicated by an involvement of the central nervous system, as observed in ten children. Their conclusions are as follows: Disturbances of the central nervous system occurring in the course of epidemic parotitis are relatively frequent, though they are not as frequently diagnosed. They are manifested either by mild excitatory reactions of the central nervous system, such as vomiting, headache, apathy, slow pulse, sluggish pupillary reaction, slight rigidity of the neck and a Kernig sign, or by a clear clinical picture of meningitis and less frequently by one of meningo-encephalitis. The meningitic symptoms usually follow the full development of the parotitis, though they may at times precede it. A valuable aid in the differential diagnosis of the postparotitic involvement of the central nervous system is lymphocytosis of the cerebrospinal fluid and an absence of leukocytosis in the blood.

BODER, Los Angeles.

THE WATERHOUSE-FRIDERICHSEN SYNDROME (A RENAL APOPLEXY). M. DE BRUIN, Maandschr. v. kindergeneesk. **6**:343 (June) 1937.

Bruin describes a case in a boy of 5 years. Before death the meningococcus could be cultivated from the blood as well as from the cerebrospinal fluid. Of the characteristic cutaneous symptoms, there were present only some very small hemorrhages of the skin and one in the conjunctiva, which did not grow larger till death appeared, within twenty-four hours. A small brother of this child died at the same time from meningococcic meningitis.

VAN CREVELD, Amsterdam, Netherlands.

THE SENSIBILITY TO SCARLET FEVER OF WOMEN IN CHILDBED. D. HERDERSCHÉE, Nederl. tijdschr. v. geneesk. **81**:2710 (June 12) 1937.

The puerperium as such does not increase the susceptibility of the mother to scarlet fever. If during lactation a mother contracts scarlet fever, breast feeding should not be stopped, but the same preventive measures should be taken as in the case of a cold or angina.

VAN CREVELD, Amsterdam, Netherlands.

## Chronic Infectious Diseases

MIXED INFECTIONS WITH HUMAN AND BOVINE TUBERCLE BACILLI IN THE HUMAN SUBJECT. A. S. GRIFFITH, Tubercle **18**:193 (Feb.) 1937.

Mixed infections with human and bovine tubercle bacilli have been found in 10 of the 6,000 or more cases examined bacteriologically in Great Britain. It is probable that the two types of bacilli do not often enter the body at the same time. They may set up independent lesions at the different portals of entry or may colonize the same lesion in a gland or an organ. Mixed cultures have been obtained from the mesenteric glands, the bronchial glands and the lungs. There is no authenticated instance of the occurrence of the two types together in an isolated distal lesion such as one of the central nervous system or of a bone, a joint or a kidney. Griffith reports a case of mixed infection in a girl 18 years old. Tubercle bacilli of the bone type alone were obtained from the meninges, while the lung yielded both human and bovine bacilli.

EUGENE SMITH, Ogden, Utah.

PROGNOSTIC SIGNIFICANCE OF THE VON PIRQUET CUTANEOUS REACTION IN ADULTS. W. G. WATSON, Tubercle **18**:241 (March) 1937.

After nine years' observation of ninety-six persons with clinical evidence of tuberculosis, Griffith concludes that those who show strong Pirquet reactions have a better chance of survival than those who do not. It appears that the power to give a strong reaction ameliorates the prognosis in persons with clinical evidence of tuberculosis and that even when the reaction is artificially produced it improves the prognosis in the apparently healthy as regards infection with virulent tuberculosis. Watson has constructed a hypothesis to explain these findings, which he sets out in this paper.

EUGENE SMITH, Ogden, Utah.

PROGRESSIVE EVOLUTION OF JUVENILE DEMENTIA PARALYTICA IN SPITE OF INTENSIVE TREATMENT WITH ACETARSONE IN A PATIENT WITH HEREDOSYPHILIS TREATED SINCE BIRTH. L. MARCHAND, M. BRISSOT and P. DELSUC, Ann. méd.-psychol. **95**:93 (Jan.) 1937.

From the standpoint of clinical evolution one may distinguish two types of juvenile dementia paralytica—one "massive," leading rapidly to profound dementia and "acquired idiocy," the other slowly progressive and characterized by a selective impairment of memory and attention, with relative preservation of reasoning and judgment. The authors report a case of the second type. A boy, born at full term, had pemphigus at birth. For ten consecutive years he received antisyphilitic treatment and appeared healthy clinically. At 10 years of age he began to show signs of deterioration and at 12 had to be taken out of school. At about this age he had the first epileptiform attack. At 13 his mental age was 6½ years. Examination of the spinal fluid showed a positive Wassermann reaction, 24 lymphocytes per cubic millimeter and 60 mg. of protein per hundred cubic centimeters. Fever therapy was without effect. Neurologic symptoms and deterioration progressed. In 1933, at the age of 14 years, he began to receive treatment with acetarsone. In 1934, at the age of 15, there occurred an apparent arrest in the evolution of the disease. The tremor, dysarthria, ataxia and exaggeration of tendon reflexes subsided. However, the morbid process was not arrested, as was shown by recurrent epileptiform attacks, in one of which he died, at the age of 16 years and 2½ months. Postmortem study of the central nervous system revealed lesions of dementia paralytica in full evolution. The inflammatory process was diffuse. The pia mater was so infiltrated in places as to produce a gummatous appearance. Proliferation of the microglia and of large astrocytic monster cells, especially in the cortex, revealed a pathologic process of extreme intensity. The authors conclude that treatment for the slowly progressive type of juvenile dementia paralytica.

resembling the disease in adults, is ineffective and that therapy for this type, as for all the other infantile encephalopathies, remains purely preventive, viz., treatment of the parents before conception and of the mother during gestation.

YAKOVLEV, Waltham, Mass. [ARCH. NEUROL. & PSYCHIAT.]

VARIATIONS IN THE FREQUENCY OF ACTIVE AND INACTIVE TUBERCULOSIS IN A CHILDREN'S CLINIC FROM 1921 TO 1935. P. NOBÉCOURT and S. B. BRISKAS, Bull. Soc. de pédiat. de Paris **34**:270, 1936.

The percentage of negative reactions to the tuberculin test in young children has increased since 1927, and the percentage of children with inactive tuberculosis has diminished by about one half. The number of cases of active tuberculosis showed no appreciable decrease in the age groups from birth to 15 years when 1921 was compared with 1935.

BENJAMIN, Montreal.

AFEBRILE GLANDULAR AND PULMONARY SYNDROME IN A SYPHILITIC NEW-BORN INFANT. B. WEILL-HALLÉ and JAIS, Bull. Soc. de pédiat. de Paris **34**:274, 1936.

A 2 month old boy with congenital syphilis began to have spells of coughing and dyspnea but no cyanosis a few days after birth. There were moist râles scattered throughout the lungs. Roentgenologic examination revealed diffuse generalized involvement of both lungs and widening of the mediastinum, resembling miliary tuberculosis. The tuberculin test was repeatedly negative. There was no fever. The condition was considered to be syphilitic, and treatment was instituted.

BENJAMIN, Montreal.

EARLY HEREDITARY NEUROSYPHILIS WITH DYSPHAGIA, LARYNGEAL PARALYSIS AND OPTIC ATROPHY. H. GRENET and P. ISAAC-GEORGES, Bull. Soc. de pédiat. de Paris **34**:328, 1936.

A 6 month old girl who had congenital syphilis showed gradual involvement of the optic, left oculomotor, left vagus and to a lesser extent right vagus and right hypoglossal nerves. There was also a cerebellar lesion, as the infant had nystagmus. Under antisyphilitic treatment the dysphagia, which had been present since birth, disappeared and the general condition improved.

BENJAMIN, Montreal.

A SUMMARY OF ONE HUNDRED CASES OF PRIMARY TUBERCULOUS INFECTION OBSERVED IN PARISIAN CHILDREN FROM TWO TO SIXTEEN YEARS OLD. M. COFFIN, Bull. Soc. de pédiat. de Paris **34**:347, 1936.

Of 703 children followed for seven and a half years, 100 came to show positive reactions to tuberculin. The percentage of boys in whom the reactions became positive was greater than that of the girls, but the latter showed a greater percentage of severer forms of tuberculosis, especially at the period of puberty. The largest number began to give positive reactions between the fifth and tenth years of life. In 28 children no definite source was found to account for the tuberculous infection.

BENJAMIN, Montreal.

"GRANULIE FROIDE" OR CHRONIC MILIARY TUBERCULOSIS IN CHILDREN. A. VALLETTE and E. STOERR, Bull. Soc. de pédiat. de Paris **34**:417, 1936.

Six cases of miliary tuberculosis in children are reported. The course of the disease extended over many months, after which roentgenologic examination of the chests showed that the lesions had cleared or had begun to calcify. In none were tubercle bacilli found in the sputum. One child died of tuberculous meningitis. The blood sedimentation rates in all cases were consistently high.

BENJAMIN, Montreal.

PRIMARY GLANDULAR AND PULMONARY TUBERCULOSIS WITH LEFT-SIDED DIAPHRAGMATIC PARESIS AND VERRUCOUS LUPUS IN A CHILD TWO AND A HALF YEARS OLD. L. RIBADEAU-DUMAS, MME. SIGUIER and M. GHARIB, Bull. Soc. de pédiat. de Paris **34**:539, 1936.

The title summarizes the report. The child had been given BCG.

BENJAMIN, Montreal.

ERYTHEMA NODOSUM AS EVIDENCE OF INCREASED ALLERGY TO TUBERCULIN; ITS APPEARANCE FOLLOWING TUBERCULIN REACTIONS. J. J. BINDSCHEDLER, Bull. Soc. de pédiat. de Paris **34**:545, 1936.

This is a report of four observations of erythema nodosum following the tuberculin test in children. The possibility that the tuberculin test increases hypersensitiveness to tuberculin just enough to bring out erythema nodosum as an allergic manifestation is discussed.

BENJAMIN, Montreal.

ZONA AND TUBERCULOSIS. SARROUY LE GENISSEL and STORA, Bull. Soc. de pédiat. de Paris **34**:553, 1936.

An Arabian boy 11½ years old had herpes zoster at the level of the seventh and eighth left intercostal spaces. Twelve days later erythema nodosum developed on the extremities. The tuberculin reaction was positive. Roentgenologic examination showed an increase in the hilar shadows, more marked on the right side. The appearance of herpes zoster in a tuberculous child has been considered by some as a bad omen. That this is not necessarily so is borne out in this instance, as the boy's general condition five months later was very good. It is believed that the association of zona and tuberculosis in this case was probably a coincidence.

BENJAMIN, Montreal.

FEBRILE HEREDITARY SYPHILIS. H. GRENET, Bull. Soc. de pédiat. de Paris **34**:565, 1936.

A boy 11½ years old had an infection of the upper respiratory tract, was vaccinated three weeks later and subsequently complained of rheumatic pains in the upper extremity and occasionally in the spine. The spleen and, to a lesser extent, the liver were enlarged. The disease ran a febrile course for about a year. Despite the absence of any positive history of syphilis in the family and negative serologic reactions, a diagnosis of congenital syphilis was made, and antisyphilitic treatment was instituted. Intravenous injections of a mercurial preparation were followed by temporary recession of the fever, and a series of intramuscular injections of sulfarsphenamine were given. The fever subsided, and the spleen and liver gradually diminished in size. Roentgenologic examination showed the right frontal sinus to be replaced by dense bone; this is considered to be a sign of congenital syphilis. Skin tests for tuberculosis and Brucella abortus infection were negative. No mention is made of any blood culture or of the sedimentation rate; as for a blood count, only the remark that there was no anemia is evidence that one was made.

BENJAMIN, Montreal.

DACTYLITIS AND SPONTANEOUS AMPUTATION OF A PHALANX IN A SYPHILITIC (?) INFANT. G. BLECHMANN and R. KOHN, Bull. Soc. de pédiat. de Paris **34**:585, 1936.

Soon after birth a male infant had lesions involving the third phalanx of the middle finger and the second phalanx of the thumb of the left hand resembling burns. Dry gangrene developed, and about a month later the terminal phalanx of the middle finger sloughed off. The Wassermann reactions of the blood of the mother and of the infant were negative. The infant had an enlarged liver and an enlarged spleen. When 3½ months old, the infant died after severe diarrhea. No mention is made of necropsy.

BENJAMIN, Montreal.

Discovery and Prophylaxis of Tuberculosis in School. G. Dreyfus-Sée, Bull. Soc. de pédiat. de Paris **34**:588, 1936.

It is recommended that a form be signed by parents of children on enrolment of the latter in school authorizing the performance of the tuberculin test on the children by the school physician and repetition of the test at intervals, e. g., annually, or when it is deemed desirable. Of course, if the test has been performed by a private physician and the child presents a certificate to that effect, it is not necessary for the school physician to do it. Discussion on the subject is invited.

Benjamin, Montreal.

Pulmonary Tuberculosis in Infancy. M. Lamy, Nourrisson **25**:94 (March) 1937.

Pulmonary tuberculosis in infancy may evolve in several different patterns, depending on several factors, viz., (1) the age of the infant, (2) the intimacy of exposures, (3) the duration of exposures and (4) the number of exposures.

Several clinical types are described: (1) benign or insidious, (2) typhoid, (3) malignant and (4) latent.

The importance of tuberculin testing and checking with roentgenograms is stressed.

The symptoms, prognosis and treatment of each type are discussed.

McClelland, Cleveland.

Supposed Influence of Whooping Cough, Measles and Scarlet Fever on Tuberculous Infection. A. Dufourt and J. Viallier, Rev. de la tuberc. **3**:321 (March) 1937.

Dufourt and Viallier undertook to determine by observations on patients in a sanatorium the influence, if any, of measles, whooping cough and scarlet fever on the course of tuberculous infection. They report a series of cases of each of these complications observed and followed up in their practice. Contrary to older teachings, they found that such intercurrent infections, almost without exception, had no apparent effect on the tuberculous process. Examination of the children afterward showed no other than the expected changes favorable or unfavorable to the primary disease.

Eugene Smith, Ogden, Utah.

Dental Anomalies in Connatal Syphilis. Mariële Döring, Dermat. Wchnschr. **102**:483 (April 18) 1936.

The author finds specific changes of the teeth in connatal syphilis in the following "grades": (1) barrel and screwdriver teeth, (2) Hutchinson teeth and (3) atrophy of the first molars. The changes most frequently seen belonged to the first group.

Taussig, San Francisco. [Arch. Dermat. & Syph.]

## Diseases of Blood, Heart and Blood Vessels and Spleen

Congenital Stenosis of the Abdominal Aorta. W. d'A. Maycock, Am. Heart J. **13**:633 (June) 1937.

An unusual congenital narrowing and complete occlusion of the midabdominal segment of the aorta, immediately below the renal branches, in a girl aged 18 years are described. Physical examination of the cardiovascular system revealed enlargement of the heart, systolic murmurs at the cardiac apex and over the pulmonary area, accentuated pulsation in the brachial and carotid arteries, a capillary pulse in the lips and nail beds, and weak pulsation in the abdominal aorta and in the femoral, dorsalis pedis and posterior tibial arteries. The systolic blood pressure in the arms was 225; that in the left leg, 80. Amebic dysentery, with perforation of a cecal abscess, was the cause of death.

Autopsy disclosed the midaortic narrowing and thrombotic obstruction, with marked aortic widening above it. Below the point of obstruction the aorta and its iliac branches were delicate and well preserved. Maycock concludes that the anomaly was congenital and that it was due to lack of proper fusion of the original two dorsal aortas, with regression and loss of one of them. GIBSON, Chicago.

SNAKE VENOM IN HEMORRHAGIC STATES. Editorial, Ann. Int. Med. **10**:1595 (April) 1937.

Snake venom is of definite value in the control of certain types of hemorrhagic conditions. However, the experience with venom is as yet too limited to state what the ultimate results will be. READING, Galveston, Texas.

RHEUMATIC HEART DISEASE IN PHILADELPHIA SCHOOL CHILDREN. J. M. CAHAN, Ann. Int. Med. **10**:1752 (June) 1937.

The medical records of 33,293 children in the public schools of Philadelphia are reviewed. From this number 391 were selected for study. A table showing the conditions found in the latter group in the order of prevalence is appended.

A new landmark, the preaxillary line, is described. This line extends midway between and parallel to the midclavicular and anterior axillary lines. The author believes that this line offers a more accurate method for localizing the apex of the heart.

In the group of 391 children selected, 191 were found to have either congenital or acquired heart disease.

The importance of recognizing children who have heart disease and the proper handling of them during the early educational years is stressed.

READING, Galveston, Texas.

REACTION OF THE BLOOD PRESSURE ON 400 SCHOOL CHILDREN TO A STANDARD STIMULUS. E. A. HINES JR., J. A. M. A. **108**:1249 (April 10) 1937.

Hines measured the reactivity of the blood pressure to local cold. Of 400 school children studied, 18 per cent were hyperreactive in respect to the systolic and the diastolic blood pressure. There was an increase in the reaction before and during puberty, but the incidence of children with hyperreactions was found to be about the same in the different age groups. The reaction of the diastolic blood pressure is much greater in children than in adults. BONAR, Salt Lake City.

EXCESSIVELY RAPID HEART RATES. J. A. LYON, J. A. M. A. **108**:1393 (April 24) 1937.

Only sixteen cases have been reported in which a ventricular rate of 280 or over was found, and in no case have electrocardiographic records exceeded 300 per minute. A ventricular rate of from 310 to 313 was recorded electrocardiographically for a 4½ month old baby. The record was taken at the onset of a fatal attack of streptococcic meningitis. At autopsy there was no gross or microscopic evidence of infection or fibrosis of the heart muscle. The arrhythmia was interpreted as paroxysmal auricular flutter with a one to one response and intraventricular block due to fatigue of the heart muscle.

BONAR, Salt Lake City.

FOWL LEUKOSIS. C. D. LEE, H. L. WILCKE, C. MURRAY and E. W. HENDERSON, J. Infect. Dis. **61**:1 (July-Aug.) 1937.

The term "fowl leukosis" is used to include the transmissible leukemic, aleukemic and leukemic-like diseases of fowls. In all its expressions the disease may be transmitted to healthy chicks by injecting tissue suspensions of affected organs

or by injecting cell-free filtrates, or it may be transmitted by direct contact within the pen or by the rearing of chicks on contaminated litter.

The injection of a suspension made from material representing fowl leukosis of one type apparently produces all the various types considered as expressions of this disease. Different suspensions produced similar results. Neurolymphomatosis associated with ocular lesions, hemocytoblastosis, and lymphoid, erythroid and myeloid types of leukosis are different expressions of the same disease and are transmitted by a common etiologic agent.

The clinical course is in some cases comparatively short; in others it extends over a period of months. No complete recoveries occur. There seems to be a definite inherent difference of susceptibility and resistance in individual birds and in different strains of birds. The evidence suggests that the disease may be transmitted through the egg to a limited extent. The most important methods of control are proper sanitation and use of breeding stock from resistant sources.

TOOMEY, Cleveland.

HUMAN BLOOD SERUM IN THE TREATMENT OF ANEMIA ASSOCIATED WITH JAUNDICE IN THE NEWBORN INFANT. G. N. KROST, J. Pediat. **10**:613 (May) 1937.

Three new-born infants suffering from anemia associated with severe jaundice were given daily intramuscular injections of from 10 to 12 cc. of blood serum for one, three and four days, respectively. A marked improvement in their general condition followed immediately. Two of the patients were given, in addition, liver and stomach extract and a preparation of iron and liver. Krost classifies the condition in these three infants as probable mild erythroblastosis, though two showed no erythroblasts in the blood smear, and the third had an erythroblast count well within the normal range.

RAUH, Cincinnati.

EFFECT OF REPEATED BLOOD TRANSFUSIONS UPON THE ERYTHROCYTE SEDIMENTATION RATE IN RHEUMATIC HEART DISEASE. L. C. ROSENBERG, J. Pediat. **10**:648 (May) 1937.

A 9 year old white boy suffering from his sixth attack of active rheumatic heart disease was treated for twelve weeks without improvement. Repeated small blood transfusions were then given, following which marked lessening of the sedimentation rate, a drop in temperature to normal and clinical improvement occurred. A review of the literature is presented.

RAUH, Cincinnati.

LYMPHATIC LEUCEMIA WITH PERTUSSIS. W. LEVY, M. J. H. GRAND and S. A. KRAKAUER, J. Pediat. **10**:781 (June) 1937.

This is a report on a 7 year old white boy suffering from lymphatic leukemia and pertussis. The observations at autopsy are included in the report, with a discussion of the difficulties encountered in differentiating lymphocytic reactions in acute lymphatic leukemia and pertussis.

RAUH, Cincinnati.

HEMOPHILIA IN NEGROES: THREE CASES AND TWO GENEALOGIC CHARTS. D. J. PACHMAN, J. Pediat. **10**:809 (June) 1937.

This is a report on three colored children with hemophilia seen at Duke Hospital. The genealogic charts of two of them are fairly typical and are included in the report. There was no family history for the third child, but the roentgenograms and the history of the patient were typical of hemophilia. A discussion of the heredity in hemophilia is presented. A blood coagulant extract from the placenta was tried in two cases, with apparent good results in one. Treatment with theelin was followed by improvement in one case.

RAUH, Cincinnati.

EFFECT OF EPINEPHRINE ON THE BLOOD COUNT AND ON HEMATOCRIT VALUES. S. P. LUCIA, P. M. AGGELER, G. D. HUSSER and M. E. LEONARD, Proc. Soc. Exper. Biol. & Med. **36**:582 (June) 1937.

Seventy-eight human subjects were given 1 cc. of a 1:1,000 solution of epinephrine hydrochloride subcutaneously in the deltoid region. Tenderness over the spleen and long bones occurred in some of the patients who had diseases of the blood-forming tissues. There was a numerical increase of the erythrocytes and leukocytes uniformly, also in the eight subjects with splenectomy. Lymphocytes were the first to increase, but immature forms did not appear. The hematocrit values increased. The calculation of the mean corpuscular volume varied too greatly to be of significance. The fragility of the red cells was unaltered. Epinephrine added to whole blood in vitro produced no significant changes. The results of the experiments suggest that the leukocytosis following injection of epinephrine hydrochloride is due to hemoconcentration.

HANSEN, Minneapolis.

AMINO ACIDS (NATURAL AND SYNTHETIC) AS INFLUENCING HEMOGLOBIN PRODUCTION IN ANEMIA. G. H. WHIPPLE and F. S. ROBSCHEIT-ROBBINS, Proc. Soc. Exper. Biol. & Med. **36**:629 (June) 1937.

Standardized dogs made anemic by withdrawal of blood were given certain pure crystalline amino acids, and the production of hemoglobin was studied. It was found that histidine, the natural, or levorotatory, form, brought about increased production of hemoglobin. The increase in hemoglobin approximated one third of the increase due to liver feeding in control periods. In a single experiment the dextrorotatory or optical isomer had a similar effect. Phenylalanine fed in the dextrorotatory, or the levorotatory or the dextrolevorotatory form also causes increased production of hemoglobin.

HANSEN, Minneapolis.

INTRAVENOUS INJECTION OF AMINO ACIDS IN REGENERATION OF SERUM PROTEIN FOLLOWING SEVERE EXPERIMENTAL HEMORRHAGE. R. ELMAN, Proc. Soc. Exper. Biol. & Med. **36**:867 (June) 1937.

Intravenous injection of complete mixtures of amino acids caused a striking regeneration of serum protein in dogs which had been subjected to a single severe hemorrhage. Thus amino acids introduced in this way are utilized in the regeneration of serum protein. Clinical observation in patients unable to take protein by mouth have given similar results.

HANSEN, Minneapolis.

ACCESSORY SPLEENS. M. PAUL, Lancet **2**:74 (July 10) 1937.

A 15 year old Singhalese girl was admitted to the hospital with the provisional diagnosis of congenital polycystic right kidney. A dull ache in the right side of the abdomen and frequency of micturition were the complaints. A roentgenogram taken after injection of iopax showed the right renal pelvis three times the normal size. At operation two accessory spleens, in addition to the normal spleen, were found, which caused clinical symptoms and signs because of their unusually large size. They were independent masses of tissue, and their position was unusual, being comparable to the position of the spleen in some amphibians and reptiles.

LANGMANN, New York.

THE ACUTE ANEMIC SYNDROME OF LEDERER IN CHILDREN. A. COLARIZI, Riv. di clin. pediat. **35**:517 (June) 1937.

Lederer's syndrome (*Am. J. M. Sc.* **179**:228, 1930) is an acute infectious hemolytic anemia with leukocytosis and erythroblastemia. A permanent recovery follows transfusion of blood.

Colarizi reports a case fitting into this syndrome, that of a boy of 7 in whom anemia developed with an attack of follicular tonsillitis. On the sixth day of

illness the red blood cell count was 1,120,000, the hemoglobin content 20 per cent and the white blood cells count 21,500. Transfusion of blood resulted in improvement, but the child did not wholly recover for several months. A study was made of the parents and the six living siblings; one gave a history of an attack of anemia similar to the patient's; three showed increased bilirubinemia, two increased fragility of the red cells and five eosinophilia. It is quite possible that there is a familial predisposition to Lederer's syndrome.

HIGGINS, Boston.

MITRAL STENOSIS. V. MENGOLI, Riv. di clin. pediat. **35**:546 (June) 1937.

The case of a boy of 11 with pure mitral stenosis is described. Death followed an attack of acute pancarditis of rheumatic nature. At no time did the boy have any arthritic symptoms.

HIGGINS, Boston.

HEMOPHILIA. VALDEMAR SCHULTZ RIBEIRO, Arch. de pediat., Rio de Janeiro **9**:171 (March) 1937.

Ribeiro's treatment of hemophilia consists of injections of maternal blood (10 cc.) every two or three hours during the active bleeding period. An 11 year old boy with this condition was treated in this manner. The results of the studies of the blood are presented.

SANFORD, Chicago.

PURPURA THROMBOCYTOPENICA FOLLOWING THE USE OF SEDORMID (A UREIDE PREPARATION). W. LIEBERHERR, Med. Klin. **33**:475 (April 2) 1937.

Lieberherr reports a case in which an idiosyncrasy to sedormid (a ureide preparation) developed after a single dose of the drug and another case in which an anaphylactic reaction occurred after prolonged use of the drug. He is of the opinion that the reactions occur only in persons sensitive to the drug. According to his observations, thrombocytopenia is not produced in normal persons following the administration of sedormid.

SIEMSEN, Chicago.

INTERFEROMETRY. E. KNOPF, Monatschr. f. Kinderh. **70**:27 (April) 1937.

Efforts have been made to determine the quantities of various hormones in the blood by means of the interferometer. Knopf devotes twenty pages and a series of charts to show that this method is valueless.

GERSTLEY, Chicago.

DISEASE OF HEMATOPOIETIC SYSTEM. ANNA VON SZÁSZ and STEFAN VON GÁRDOS, Monatschr. f. Kinderh. **70**:105 (April) 1937.

Several cases are reported in which abnormalities of the blood developed in infants after birth. These abnormalities were obviously due to severe anemia, malnutrition or abnormalities of the blood in the mother which must have affected the composition of the milk. It was interesting that in spite of the mothers' handicap, the babies were born without symptoms and presented them only after a period of nursing. Szász and Gárdos also advocate the injection of epinephrine in doubtful cases of aleukemia. Contraction of the blood vessels from the epinephrine may force the abnormal cells into the blood stream, where they may be identified.

GERSTLEY, Chicago.

AGRANULOCYTOSIS AND HYPERSENSITIVITY TO AMINOPYRINE. GRAGE, München. med. Wchnschr. **84**:666 (April 23) 1937.

The relation of aminopyrine to agranulocytosis was reported independently in Denmark and in America about the same time. Aminopyrine is used extensively by Grage and by most physicians in Germany. However, Grage has failed to find a case of agranulocytosis among his patients, although he has been watching for

such a case for several years. In Denmark the morbidity and mortality from this disease was high until the sale of medication containing aminopyrine was restricted.

Agranulocytosis seems to be an anaphylactic process in susceptible persons. Some patients tolerated aminopyrine for long periods before susceptibility developed. This predisposition is due to an endocrine dysfunction during the climacterium.

BRAHDY, Mount Vernon, N. Y.

THE ERYTHROCYTE SEDIMENTATION TEST: CORRECTION FOR VARIATIONS IN CELL VOLUME APPLIED TO THE GRAPHIC METHOD WITH OBSERVATIONS ON ITS USE IN TUBERCULOSIS. B. H. Y. T'ANG, Chinese M. J. **51**:445 (April) 1937.

T'ang gives a brief general survey of the subject, discusses the factors affecting the test and presents numerous tables illustrating the technic and the results, with reference especially to pulmonary tuberculosis. Whether any of the patients who suffered from pulmonary tuberculosis were children is not stated. T'ang feels that the results obtained with the sedimentation test on 200 patients with pulmonary tuberculosis, with red cell volumes either above or below normal, demonstrate the value of correcting the blood to a normal cell volume before performing the test.

NEFF, Kansas City, Mo.

OCCURRENCE OF FETAL HEMOGLOBIN IN YOUNG INFANTS. J. H. P. JONXIS, Maandschr. v. kindergeneesk. **6**:356 (June) 1937.

After birth all hemoglobin shows its fetal characteristics. In the full term baby, this fetal character of the hemoglobin slowly diminishes, whereas in the premature child the whole hemoglobin remains fetal until the day on which under normal circumstances the birth should have taken place. So it appears that with regard to the fetal hemoglobin there exists a marked difference between the normal and the premature infant. Jonxis discusses the frequent occurrence of anemia in premature infants from this point of view.

VAN CREVELD, Amsterdam, Netherlands.

## Diseases of Nose, Throat and Ear

CHRONIC SUPPURATIVE OTITIS MEDIA. A. H. PERSKY, Arch. Pediat. **54**:425 (July) 1937.

The various methods of treatment of otitis media are outlined.

ORR, Buffalo.

PATHOGENIC STAPHYLOCOCCI IN THE ANTERIOR NARES: THEIR INCIDENCE AND DIFFERENTIATION. F. A. HALLMAN, Proc. Soc. Exper. Biol. & Med. **36**:789 (June) 1937.

Cultures were made of matter from the nares of 468 persons who were without evidence of infection of the upper respiratory tract or of staphylococcic infection elsewhere. The organisms were differentiated into pathogenic and nonpathogenic forms by means of the plasma coagulation test. In addition cultures were obtained from 51 subjects with chronic staphylococcic osteomyelitis. Forty per cent of persons over 19 years and 60 per cent of those under 20 years who had no evidence of infection harbored pathogenic staphylococci in their nares. Among the patients with osteomyelitis the percentage of those with pathologic bacteria in the nares was slightly higher in the group over 19 years and slightly lower in the group under 20 years than in the group of normal controls. The plasma coagulation reaction was the preferred method of differentiating between pathogenic and nonpathogenic strains of staphylococci; the fermentation of mannite, the crystal violet reaction and the production of dermonecrotoxin are also reliable confirmatory methods for such differentiation.

HANSEN, Minneapolis.

THE TREATMENT OF CLEFT-PALATE SPEECH. W. K. WARD, South African M. J. **11**:433 (June 26) 1937.

The two great difficulties which most patients with cleft palate are faced with are (1) that of preventing nasal emission of breath, which results in the peculiarly unpleasant hollow intonation, and the "fluffy" articulation of consonants which characterizes the speech and (2) that of approximating the velum to the back of the tongue sufficiently to produce the k and g sounds. Ward describes exercises to overcome these difficulties.

GONCE, Madison, Wis.

THROMBOSIS OF THE OPHTHALMIC VEIN DURING GENERALIZED INFECTION WITH MASTOIDITIS; STREPTOCOCCUS VIRIDANS IN BLOOD CULTURE. P. ARMAND-DELILLE and J. BOYER, Bull. Soc. de pédiat. de Paris **34**:537, 1936.

A boy 7 years old had mastoiditis of long standing. Exophthalmos developed with edema of the lids and cornea of the right eye. Blood culture showed a growth of Streptococcus viridans. The boy died two days after an operation on the mastoid. It was felt that thrombosis of the right ophthalmic vein had occurred. No necropsy was performed.

BENJAMIN, Montreal.

ANGINA, PHARYNGITIS AND RHINOPHARYNGITIS. W. MULLER DOS REIS, J. de pediat., Rio de Janeiro **4**:294 (July) 1937.

This article records the results of a differential study of the conditions named.

SANFORD, Chicago.

## Diseases of Lungs, Pleura and Mediastinum

POSTOPERATIVE PULMONARY ATELECTASIS. H. LEVY and A. M. LITVAK, J. Pediat. **10**:632 (May) 1937.

A case of postoperative pulmonary atelectasis following an appendectomy in a 14½ year old boy is reported, and the etiology, diagnosis, prognosis, prophylaxis and treatment of postoperative pulmonary atelectasis are reviewed.

RAUH, Cincinnati.

A REVIEW OF THE TREATMENT OF PNEUMONIA IN EARLY INFANCY. F. A. PEROCCO, Prat. pediat. **15**:3 (May) 1937.

This is a cursory review of the therapeutic procedures available in the treatment of pneumonia. The author offers neither new material nor new opinions.

DOOLEY, New York.

BRONCHOPNEUMONIA FOLLOWED BY SUBCUTANEOUS THORACIC-CERVICAL EMPHYSEMA. E. COMANDOLI, Prat. pediat. **15**:21 (May) 1937.

A case is briefly reported. The child, 2 years old, recovered within fifteen days.

DOOLEY, New York.

THE VASOMOTOR MECHANISM OF THE LUNGS. O. DIEBOLD, Deutsche Ztschr. f. Chir. **248**:612, 1937.

Diebold, through research on dogs, believes that he has conclusively settled the disputed question as to whether or not the blood vessels of the lungs are under the control of a nervous vasomotor mechanism. He states that the sympathetic system controls vasoconstriction of the lungs and the parasympathetic system vasodilatation. The existence of such a mechanism permits reflex congestion of different parts of the lungs. The lungs act as a blood reservoir only in the sense of a protective mechanism to counterbalance marked variations in the general blood

flow of the body. The vasomotor mechanism of the lungs plays a special rôle in the respiratory activity of the pulmonary epithelium. Not all parts of the lungs share in such activity at the same time. Under normal conditions epinephrine acts to constrict the pulmonary vessels. Carbon dioxide in the inspired air in concentrations of from 5 to 12 per cent causes constriction of the pulmonary vessels. Acetylcholine probably acts through the parasympathetic nervous system to cause dilatation of the vessels of the lungs. GLASER, Rochester, N. Y.

TREATMENT OF PNEUMONIA IN CHILDREN BY STIMULATION WITH FRESH AIR. J. JOCHIMS, Ztschr. f. Kinderh. **58**:628 (March 20) 1937.

That cold air acts as a circulatory stimulant is evidenced by flushing and proportionate elevation of the temperature of the skin of the cheeks within from thirty to sixty minutes after a child is returned from cold air to a warm room. The skin reaction disappears after about four hours. Jochims advocates keeping a pneumonic child (with a few exceptions) alternately in warm indoor air for six hours and in cold outdoor air for six hours. SIEMSEN, Chicago.

## Diseases of the Gastro-Intestinal Tract, Liver and Peritoneum

EPIDEMIC GASTRO-INTESTINAL INTOXICATION. O. L. VON CANON, Arch. Pediat. **54**:360 (June) 1937.

An epidemic disease occurring in children, characterized by vomiting, diarrhea or constipation with certain toxic symptoms, is described. It is thought to be infectious, although the etiology is unknown. ORR, Buffalo, N. Y.

IRON THERAPY IN HEPATOMEGALY. H. L. EDER and P. A. GRAY, Arch. Pediat. **54**:403 (July) 1937.

Iron was administered to five children with enlargement of the liver. Within a few days to two weeks after starting this therapy the lower margin of the liver in all instances receded beneath the costal arch. The clinical findings were confirmed by roentgen evidence of reduction in size of the liver. Four of the patients were diabetic.

No attempt was made to classify these cases of hepatomegaly, but the authors suggest that the conditions observed might be regarded as instances of von Gierke's syndrome. The hypothesis is also suggested that some relationship may exist between deficiency of iron in the tissues and hepatomegaly.

ORR, Buffalo, N. Y.

HEPATOSPLENOMEGALY? IDIOPATHIC CIRRHOSIS. C. T. POTTER, Proc. Roy. Soc. Med. **30**:409 (Feb.) 1937.

A girl aged 5 had a severe pain in the epigastrium which lasted only a short time. During the next five days she had intermittent epigastric pain of a milder nature. She was then admitted to the hospital, and on examination of the abdomen a large tumor was found. Also bruises about the body were noticed. The mother claimed that the child had had a tendency to bruise ever since she was an infant. The past history, the family history and the results of physical examination and of studies of the blood, urine and material from a splenic puncture and of roentgenograms of the long bones are given in the report.

WILLIAMSON, New Orleans.

ENTERITIS WITHOUT COLITIS. O. PORGES, J. Egyptian M. A. **20**:131 (April) 1937.

This article calls attention to a syndrome encountered by Porges in Vienna, characterized by epigastralgia, flatulence, vomiting and anorexia, caused by a

catarrhal inflammation of the small intestine. The condition simulates ulcer. However, the feces show an increase of soaps and fatty acids in the form of crystals and globules. Roentgenograms after a meal of barium sulfate show speedy passage of food through the small intestine. The etiology appears to be overloading with food that is too heavy and rough or is raw. Treatment is dietary.

MULHERIN, Augusta, Ga.

GASTRIC HEMORRHAGE FROM TOXIC INFECTIONS OF INFANCY. L. RIBADEAU-DUMAS and S. LOEWE-LYON, Arch. de méd. d. enf. **40**:425 (July) 1937.

A common symptom in ulcer, trauma and the so-called hemorrhagic diseases, gastric hemorrhage attending the toxemia of any acute infection frequently invites the gravest prognosis. The extension of the bleeding to adjacent organs constitutes the most serious problem and warrants the deepest concern. Hematemesis in the nursling is characterized by its *café au lait* appearance and its small volume; the bleeding may occur at any stage of the current infection and frequently precedes death in from one to three days. In occasional cases, however, the patient has survived, which disputes the theory of agonal origin.

While bloody vomitus may appear in the course of many disorders, there are two essential factors recognized as its basis: the choleriform syndrome and the infection. The authors assert that the former plays a primary role in the genesis of the gastric hemorrhage of infancy. The clinical picture may be initiated by an independent invasion, or it may complicate a preexisting involvement; it may be characterized by the classic symptoms of cholera infantum or by marked digestive disturbances; in certain cases nervous symptoms predominate.

Infection is equally a determining factor here, as it is in most hemorrhagic states. The hemorrhage may appear in the course of the primary attack or during a relapse. The nature of the infection itself seems to be of little importance. In a series of thirty-two cases, this complication was found in pneumonia of various types, nephritis, otitis, septicemia, gonococcic ophthalmia and meningo-encephalitis.

A discussion of the possible mechanism of gastrorrhagia follows.

AMESSE, Denver.

DIETETIC TREATMENT OF ENTEROCOLITIS IN INFANTS WITH "ALEURONE" FLOURS. L. WILLEMIN-CLOG, Bull. Soc. de pédiat. de Paris **34**:300, 1936.

Infants with digestive disturbances were given feedings of a commercial preparation made up of soya or other bean flour, cream of rice, sugar and salt. Two tablespoonfuls were mixed with 300 Gm. of water. The mixture was boiled for fifteen minutes and cooled; then half a teaspoonful of malt extract was added and stirred into the mixture while it was boiled again for a minute. Rice gruel to which some salt was added was used for the first day, then the foregoing mixture half diluted with water for a few days, followed by the full strength mixture by the fifth or sixth day. As the infants improved they were gradually given milk feedings.

BENJAMIN, Montreal.

DUODENAL STENOSIS. L. RIBADEAU-DUMAS, LONGUET and FORGET, Bull. Soc. de pédiat. de Paris **34**:334, 1936.

A 2 year old girl who had vomited frequently since birth was operated on for stenosis of the third part of the duodenum. This was caused by the edge of the mesentery pressing on the duodenum. There was a defect in the mesentery through which a loop of intestine had herniated and become strangulated. The child made a good recovery and remained well.

BENJAMIN, Montreal.

VOMITING WITH ACETONEMIA: PATHOGENIC AND THERAPEUTIC CONSIDERATIONS. P. ROHMER, Bull. Soc. de pédiat. de Paris **34**:394, 1936.

Vomiting spells could not be induced in children by feeding them ketogenic diets to produce acetonemia. A transient functional disturbance of nervous or endocrine origin is possibly the basis on which recurrent vomiting occurs in some children.

BENJAMIN, Montreal.

ACUTE DYSPEPSIA IN THE INFANT FOLLOWING OTITIS: IMPORTANCE OF ALIMENTARY TREATMENT. P. ROHMER and E. SCHNEEGANS, Bull. Soc. de pédiat. de Paris **34**:405, 1936.

Two series of cases of digestive disturbance in infants following otitic infection are reported. The necessity for immediate treatment of the ears is stressed. This is not always followed by rapid cure of the intestinal symptoms, and it is important to institute measures to combat the latter just as if they were due to enteral infection.

BENJAMIN, Montreal.

CONTINUOUS INTRAVENOUS THERAPY IN THE TREATMENT OF INTESTINAL INTOXICATIONS. R. DEBRÉ and others, Nourrisson **25**:57 (March) 1937.

The technic of Schick and Karelitz for continuous intravenous therapy is described in detail. Slight changes in the composition of the fluid to be injected were made, preference being given to slightly hypertonic solutions of sodium chloride and dextrose. In some cases isotonic dextrose alone was injected. The rate of injection and the total twenty-four hour quantity are emphasized. The article includes the protocols on twelve patients to whom the treatment was given. The protocols are divided into three groups: (*a*) four on patients who showed rapid recovery, (*b*) three on patients with prolonged convalescence and (*c*) five on patients in whom the treatment failed.

The authors emphasize that the treatment is efficacious in effecting dehydration but that it fails to combat the inherent toxemia from the infection.

McCLELLAND, Cleveland.

INTUSSUSCEPTION IN INFANTS. M. FÈVRE, Rev. méd.-sociale de l'enf. **5**:81 (March-April) 1937.

This paper adds nothing to knowledge of the condition and is apparently prepared more for social workers than for doctors. The x-ray picture is particularly stressed. There are no case reports or references.

DIETRICH, Beverly Hills, Calif.

THE HEMOPOIETIC PRINCIPLE OF CASTLE AS FOUND IN THE GASTRIC JUICE OF INFANTS. S. LEVI, Riv. di clin. pediat. **35**:635 (July) 1937.

Gastric juice was collected from nine infants, some of them premature, some poorly nourished, some well nourished, some breast fed and some bottle fed. The gastric juice was injected into rats, and the percentage of reticulocytes among the red cells was determined before and after the injection. In each of the nine cases a reticulocytic response was observed. The intensity of the response had no relation to the acidity of the gastric juice or to the age, feeding or health of the infant.

HIGGINS, Boston.

IMPORTANCE OF FINDING A FLUID LEVEL IN THE INTESTINE FOR THE ROENTGENOLOGIC DIAGNOSIS OF ABDOMINAL AILMENTS OF CHILDHOOD. T. VARGA, Riv. di clin. pediat. **35**:652 (July) 1937.

Above the point of an intestinal obstruction the bowel is dilated and may contain fluid. In such cases roentgenologic examination should reveal a fluid level in a loop of bowel when the patient is in an erect position.

Varga has observed thirteen patients, eight of whom had typical symptoms of intestinal obstruction and showed a fluid level in the intestine; two had paralytic ileus without anatomic obstruction but with a fluid level, three had definite obstruction but did not show the fluid level.

The conclusions are drawn that the fluid level (1) always indicates interference with the passage of the bowel content, although its absence does not exclude interference; (2) does not differentiate between anatomic and toxic-paralytic ileus; (3) does not indicate the location of the obstruction, and (4) may be absent if the obstruction is incomplete or if there is no fluid in the intestine.

HIGGINS, Boston.

ABNORMAL TERMINATION OF THE RECTUM. A. NOGUEIRA, Arch. de pediat., Rio de Janeiro **9**:335 (June) 1937.

Three cases are discussed and illustrated with photographs of scrotal-anal anomalies.

SANFORD, Chicago.

INCREASED OCCURRENCE OF TOXICOSIS. OTTO KÜPPER, Arch. f. Kinderh. **106**:167, 1935.

A series of patients with toxicosis were admitted to the Universitäts-Kinderklinik in Bonn in the early months of 1935. Although the toxicosis was evidently of infectious origin, laboratory examination by the usual methods did not reveal a causative organism. The symptoms of toxicosis are considered to have been secondary to grip, and the hypothesis is offered that they were caused by grippal hepatitis.

CRANE, Washington, D. C.

VOLVULUS CAUSED BY AN ENORMOUS NUMBER OF ASCARIDS. I. I. GENKIN, Arch. f. klin. Chir. **182**:642 (June) 1935.

A girl of 12 years suffered from intense abdominal pain. So much spasm was present that no mass could be felt. At operation a huge mass of ascarids was found in the ileum, with early changes in the intestinal wall due to the obstruction. The worms were removed through an incision and filled a glass jar 25 by 18 by 15 cm. The number was estimated at 800. Convalescence was uneventful. A course of santonin fifteen months later produced two worms.

DAFFINEE, Boston.

CLINICAL AND ROENTGENOLOGIC EXAMINATION OF CHILDREN WHO WERE OPERATED ON BECAUSE OF HYPERTROPHIC PYLORIC STENOSIS. A. BAU, Kinderärztl. Praxis **8**:277 (July) 1937.

Seventy-six children were found to be healthy in every respect on examination eight years after operation for hypertrophic pyloric stenosis. In no case did roentgenograms of the stomach reveal any pathologic condition that could be related to the former operation.

HEYMANN, Cleveland.

SWALLOWING. ERICH HOFMANN and ALBRECHT PEIPER, Monatschr. f. Kinderh. **70**:54 (April) 1937.

A brief study of the process of swallowing in the infant, illustrated by two roentgenograms, is presented. Apparently the larynx is somewhat higher in the infant than in the adult.

GERSTLEY, Chicago.

THE RELATION OF DISTURBANCES OF INTERNAL SECRETION TO CELIAC DISEASE. A. LOESCHKE, Monatschr. f. Kinderh. **70**:86 (April) 1937.

In 1923 Schick and Wagner reported two cases of celiac disease in which at autopsy they found marked atrophy of the various organs of internal secretion.

Loeschke reports the case of a 7 year old girl who was followed in the clinic for four years and who unquestionably was suffering from celiac disease. She died of pneumonia. Autopsy showed changes in the various glands which led the author to diagnose polyglandular insufficiency. In other words, the findings confirm those of Schick and Wagner.

GERSTLEY, Chicago.

ACUTE INFLAMMATION OF MECKEL'S DIVERTICULUM WITH INTESTINAL OBSTRUCTION. N. C. KUNG, Chinese M. J. **52**:85 (July) 1937.

A Chinese infant, a boy, was operated on forty-eight hours after the onset of repeated vomiting, distention of the abdomen, failure to pass stools and leukocytosis (19,000 white cells). The roentgen films suggested only obstruction and peritonitis. At operation there was found in a collapsed loop of small intestine a yellow, necrotic and leaking Meckel diverticulum. There was a necrotic area due to pressure of the mesodiverticulum. The infant died on the operating table. Autopsy confirmed the diagnosis of rupture of the diverticulum, abscess, strangulation and perforation of the ileum by the mesodiverticulum. To make an exact diagnosis clinically is probably impossible in many instances. NEFF, Kansas City, Mo.

GANGRENOUS STOMATITIS, WITH SPECIAL REFERENCE TO SUBTERTIAN MALARIA AS AN ETIOLOGICAL FACTOR. Z. U. ZEE and R. M. PATY, Chinese M. J. **52**:95 (July) 1937.

In addition to the predisposing factors of measles, typhoid, dysentery, pneumonia, pertussis, scarlet fever and chronic exhausting diseases, kala azar has been reported as a chief factor in gangrenous stomatitis in China. Zee and Paty are the first investigators to stress malaria of the subtertian type as a cause. Twelve of the forty-five cases which they have observed followed it. Therefore malaria of the subtertian type is as common a predisposing cause as is measles. Nine children from 3 to 11 years of age were treated for this condition, with two deaths. Neglect or delay of quinine treatment is a factor. Proper nourishment, blood transfusion, the use of arsenic and quinine and cauterization gave a mortality of 22 per cent, which is much lower than that given in the textbooks.

NEFF, Kansas City, Mo.

## Nervous Diseases

RELATIONSHIP OF THE AUTONOMIC NERVOUS SYSTEM TO THE PATHOGENESIS OF EPILEPSY. K. ORZECHOWSKI, Arch. Neurol. & Psychiat. **38**:16 (July) 1937.

The author summarizes the experimental evidence pointing to the role of vascular changes in epilepsy and the probable role of the autonomic nervous system, and he adds other theoretical concepts about the exact mechanism producing convulsions.

BEVERLY, Chicago.

GOLD AND SODIUM TETRABROMIDE IN THE TREATMENT OF EPILEPSY. J. EPSTEIN, Arch. Pediat. **54**:365 (June) 1937.

The prescription of the drugs now used in the treatment of epilepsy is criticized by the author as empirical and desultory. As a superior method of drug treatment, he offers the use of gold and sodium tetrabromide. The pharmacologic action of this drug is not well known, and its effect on the nervous system is difficult to determine. As no cases are reported, his conclusions appear to be merely impressions.

ORR, Buffalo, N. Y.

SUDDEN AND UNEXPECTED DEATH OF CEREBRAL ORIGIN IN CHILDREN. C. R. BARR and A. SILVERSTEIN, Pennsylvania M. J. **40**:609 (May) 1937.

Sudden unexpected death of children arises in the experience of the general practitioner as it does in the pediatric service of a large hospital. With the hope

that some light might be shed on the pathologic background and mechanism of such catastrophies, the authors analyzed a group of cases of sudden unexpected death, based on a survey of all cases between the years 1930 and 1936 in the pediatric service at Temple University. They describe a rapidly fatal disease encountered in children, which was characterized by an explosive onset with convulsions, coma and symptoms referable to the central nervous system. Death ensued within from twenty-four to forty-eight hours. A history of a cold or of some mild infection preceded the acute onset. The clinical picture was typical of decerebrate rigidity, closely resembling the experimental preparation. The clinical diagnosis in the cases studied was usually fulminating encephalitis. At necropsy the outstanding observations in all the cases were marked cellular changes, congestion, petechiae and hydration of the brain.

LOGUE, Williamsport, Pa.

CEREBRAL SINUS THROMBOSIS IN CHILDREN. J. H. EBBS, Arch. Dis. Childhood **12**:133 (June) 1937.

Cases of thrombosis of the cranial sinus, although comparatively rare, appear to be increasing. Ebbs gives summaries of eight cases, with important facts relating to thirty-two cases recorded during fourteen years. A review of the principal signs and symptoms in these cases suggests that there is a fairly constant clinical syndrome associated with the majority of those cases in which the condition is not due to mastoiditis and cellulitis with involvement of the lateral and cavernous sinuses, respectively. There are in this group the following points, which often assist in making a correct clinical diagnosis of sinus thrombosis: sudden onset of restlessness followed by convulsions; localization of the convulsions as shown by twitching, followed by paresis; cerebrospinal fluid findings of increased or normal pressure, normal or slightly increased number of cells, the presence of red blood cells or a xanthochromic character of the fluid, sterile cultures, low sugar content, high content of chlorides and normal or slightly raised level of protein. The other points in the condition are the drowsiness or semiconsciousness and the absence of evident infection during the course of the illness. Infection is practically always found at postmortem examination. The high level of chlorides in the cerebrospinal fluid is emphasized as an aid in arriving at the diagnosis. Several attempted explanations of the thrombosis are reviewed, but no reference is made to treatment or to pathologic details.

KELLY, Milwaukee.

MUSICOGENIC EPILEPSY. M. CRITCHLEY, Brain. **60**:13 (March) 1937.

Critchley describes the occurrence of epileptiform attacks in association with hearing of music. He cites four cases which he personally observed and seven seen by colleagues. Cases of this phenomenon are too rare to permit dogmatic conclusions as to the clinical features which may be regarded as characteristic. From such evidence as is available, however, it appears that the association between stimulus and attack is close; only rarely does a seizure occur without the precipitating factor of music. On the other hand, music may be heard without an epileptic attack necessarily following. There is reason to believe that in some cases only certain types of music may be followed by unconsciousness. An attack does not usually follow promptly the onset of the music, and the stimulus may need to be maintained for many minutes before it will produce a fit. The epileptic phenomena proper vary from transient "absences" or obfuscations of consciousness to complete major attacks, with convulsive movements and vesical incontinence.

EDITOR'S ABSTRACT. [ARCH. NEUROL. & PSYCHIAT.]

INTRACRANIAL TUBERCULOMATA: A RECORD OF FOUR CASES. J. R. BEAL, Brit. J. Tuberc. **31**:99 (April) 1937.

Tuberculoma of the brain occurring during the course of tuberculosis is not common. It may occur in any part of the brain but is usually located in the sub-

tentorial region. It may be solitary or multiple, encapsulated or diffuse. The symptoms are essentially those of any other intracranial tumor. Roentgenologic examination may give valuable information as to the location of the lesion if calcification has occurred or after the injection of air into the ventricles. Beal reports four cases of this condition including one occurring in a child of 8 years.

EUGENE SMITH, Ogden, Utah.

A CASE OF TETANY WITH DIPLOPIA IN AN ADOLESCENT. Y. KERMORGANT, Bull. Soc. de pédiat. de Paris **34**:33, 1936.

A boy 15½ years old showed tetany as well as diplopia. After a week of calcium therapy he was well but still had a Chvostek sign.

BENJAMIN, Montreal.

INTRAVENOUS INJECTIONS OF HYPERTONIC SOLUTIONS IN THE TREATMENT OF CONVULSIVE FORMS OF ENCEPHALITIS IN INFANTS. L. WILLEMIN-CLOG, Bull. Soc. de pédiat. de Paris **34**:294, 1936.

Intravenous injections of from 10 to 20 cc. of 20 per cent dextrose solution were given to young children with symptoms of encephalitis in the course of infections such as pertussis and measles. Following this there was cessation of convulsions and somnolence. Repeated injections of blood from adults who had had these diseases or of convalescent serum were also administered. The hypertonic solutions act by diminishing cerebral edema and high pressure of spinal fluid.

BENJAMIN, Montreal.

CLINICO-ANATOMIC AND HISTOLOGIC STUDY OF OBSTETRICAL PARAPLEGIA: INTEREST IN VENTRICULOGRAPHY. G. HOERNER, R. MEYER and B. HAIMOVICI, Bull. Soc. de pédiat. de Paris **34**:384, 1936.

A large infant born after difficult labor had convulsions and fever two days after birth. A few days later he had palsy of the left upper extremity. The spinal fluid was xanthochromic and contained blood. Also paralysis of the urethral and anal sphincters developed. He died when a month old of urinary infection. Anatomically there were found extensive meningeal hemorrhage and sclerosis of the spinal cord. There was no hematomyelia. Air was injected into the spinal canal with some difficulty as meningeal adhesions were present. It is recommended that this procedure be attempted early and if necessary repeatedly in an effort to prevent the formation of adhesions and consequent damage to the spinal cord.

BENJAMIN, Montreal.

THE ACID-BASE BALANCE IN EPILEPSY. CAUSSADE, VERAIN and JACOB, Bull. Soc. de pédiat. de Paris **34**:424, 1936.

Nine persons from 10 to over 30 years old who had marked epilepsy were studied from the point of view of a relationship between alteration of the hydrogen ion concentration of the blood and seizures. Alkalosis was invariably observed during seizures and was more marked in children than in older persons. It tended to disappear with cessation of seizures in a few cases, but no acidosis occurred. Nothing is known concerning what role, if any, alkalosis plays in the pathogenicity of the seizures, but it appears to be indicated that in their treatment the $p_H$ of the blood should be moved toward the acid side.

BENJAMIN, Montreal.

POLYRADICULITIS WITH DISSOCIATION OF ALBUMIN AND CELL CONTENT OF THE SPINAL FLUID. SARROUY and BULLINGER-MULLER, Bull. Soc. de pédiat. de Paris **34**:556, 1936.

A boy 6 years old was seized with paraplegia, more marked in the lower than the upper extremities, loss of deep reflexes and pain, without objective sensory

disturbance. There was galvanic and faradic hyper-excitability of the muscles but no reaction of degeneration. The spinal fluid showed increase in albumin without increase in cells. Paralysis appeared forty-five days after pharyngitis. The boy made a slow but complete recovery. Culture of material from the throat showed no diphtheria bacilli but did not exclude their presence at the time of the pharyngitis. The diagnosis rested between postdiphtheritic polyneuritis and infectious polyneuritis.

BENJAMIN, Montreal.

ABSCESS OF THE TEMPORAL LOBE OF OTITIC ORIGIN, CURED BY PUNCTURE AND WIDE DECOMPRESSION. C. VINCENT, M. DAVID and H. ASKÉNASY, Rev. d'oto-neuro-opht. **15**:81 (Feb.) 1937.

It has been shown by Vincent, David and Askénasy *(Rev. d'oto-neuro-opht.* **14**:593, 1936) that it is possible to cure certain encapsulated abscesses of the brain by removal en masse without drainage and that encapsulation can be favored by preliminary puncture and wide decompression. The case reported demonstrates that in certain acute stages of abscess decompression and puncture alone may effect a cure. The 8 year old patient presented purulent otitis of the right ear and two weeks later progressively increasing intracranial hypertension. Seven weeks after the beginning of the otitis, operation revealed a nonencapsulated abscess of the temporal lobe, with extensive collateral edema. Evacuation of the pus by puncture without incision of the dura, combined with wide decompression, caused such rapid and complete disappearance of the symptoms that it seems warranted, more than ten months after the intervention, to anticipate a definite cure. The authors believe that if in certain cases puncture of the abscess and decompression transform a subacute into a chronic, encapsulated abscess which may subsequently be removed en bloc, a similar technic is capable in certain other cases of effecting a cure rapidly and more simply by causing resorption of the inflammatory focus without the necessity of capsule formation. The difference in the evolution of an abscess after decompression is due in large part to a difference in the virulence of the causal micro-organisms. In the case reported the infecting organisms were the staphylococcus and streptococcus. Cerebral edema was responsible to a greater degree than the purulent collection for the intracranial hypertension. The treatment of cerebral abscess must embrace not only evacuation of the pus, but especially, control of the edema.

DENNIS, San Diego, Calif. [ARCH. NEUROL. & PSYCHIAT.]

MULTIPLE TUBERCULOMAS IN THE BRAIN OF A CHILD. E. ZECCA, Riv. di clin. pediat. **35**:644 (July) 1937.

A child 2½ years old had been sick for about two months with fever and neurologic signs, especially tremor and weakness of the left arm and leg. There were choked disks. The tuberculin tests were negative. The child's death was apparently due to tuberculous meningitis. At autopsy as many as twenty tuberculous nodules were noted in various parts of the brain. There were also tuberculous foci somewhat larger than miliary tubercles involving the spleen, kidneys and liver. The primary focus was in the lungs, where a cavity was found; also, the hilar glands were caseous.

HIGGINS, Boston.

INHERITANCE OF ECTOMESODERMAL BLASTOMATOSES WITH SPECIAL REFERENCE TO FAMILIAL TUMOR OF THE BRAIN. F. OEHLER, Arch. f. Psychiat. **105**:324 (Sept.) 1936.

Oehler reports a study of fifty-two cases of ectomesodermal blastomatosis. Four types were observed: Recklinghausen's disease, tuberous sclerosis, retinal angiomatosis and cerebellar angiomatosis. The Recklinghausen type is observed most frequently and in most cases is associated with familial occurrence of similar tumors or of central acoustic neurinoma. Next in frequency is the familial glioma,

seven cases of which were reported. Next to this in frequency is familial tuberous sclerosis, and finally the angiomatoses. Familial glioma usually occurs in the same generation. Among the cases of familial glioma reported, one cannot find instances in two or more generations, as one can among cases of the other three types of ectomesodermal blastomatosis. In the last three forms it is probable that one is dealing with a dominant type of hereditary transmission.

MALAMUD, Iowa City. [ARCH. NEUROL. & PSYCHIAT.]

ASPECTS OF PSEUDOBULBAR PARALYSIS (STRIOPONTILE FORM) IN YOUNG PERSONS. L. BINI, Deutsche Ztschr. f. Nervenh. **143**:158 (April 1) 1937.

Bini points out that in the literature cases are reported in which foci of inflammation in the basal ganglions caused pseudobulbar paralytic manifestations. After citing some of these cases, he shows that most of the patients had in common a lesion on the external surface of the putamen, which partly involved the external capsule and the claustrum. The nucleus caudatus was less often involved. Occasionally the process spread to the thalamus, and in rare cases, also to the internal capsule. However, the characteristic feature was the focus on the external surface of the putamen. In some instances this produces the symptoms of pseudobulbar paralysis even though it did not involve the capsule, the thalamus or the nucleus caudatus. The predominant paralytic manifestation was rigidity, and it was related to the arteriosclerotic muscular rigidity described by Förster. In the majority of cases, including those observed by the author, there existed severe calcification of the vessels, so that the trophic factor played a part in the genesis of the symptoms. A second group of cases of pseudobulbar paralysis concerned pontile foci, and they were usually of an arteriosclerotic nature. Bini says that among the most interesting cases of pseudobulbar paralysis are those in which the basal ganglions or only the corpus striatum was involved. It has been suggested by some that in such cases the predominating condition is not so much paralysis as dystonia and parkinson-like symptoms. To a condition of this description, however, the term "pseudobulbar paralysis" cannot properly be applied. Nevertheless, in the older as well as in the more recent literature cases are reported in which the paralytic symptoms predominated over the striopallidal. Thus the question arises whether the striatum, in addition to its action on tonus, may not also influence motility. Bini gives his attention to this question on the bases of two cases concerning men aged 45 and 44, respectively. In the discussion of these cases he points out that there is no reason to assume that the striatum has a motor, in addition to a tonic, function, for in the majority of cases of pseudobulbar paralysis in which the striatum showed a lesion other parts of the brain were also involved, such as the pons in one of his cases. The pontile involvement seems to indicate that in such cases the striatum exerts a modifying, not a determining, influence.

EDITOR'S ABSTRACT. [ARCH. NEUROL. & PSYCHIAT.]

MIGRAINE IN CHILDREN AND YOUTHS. R. HECKER, Monatschr. f. Psychiat. u. Neurol. **94**:173 (Nov.); 237 (Dec.) 1936.

According to Hecker, migraine is commoner during the early years of life than has generally been supposed. He observed fifty-six cases of this disorder in children or youths at a clinic which excluded children below the age of 6 years. Most of the patients with migraine were from 9 to 12 years of age when admitted to the clinic. In the majority, the illness began between the ages of 6 and 10 years. In one, the first attack occurred at the age of 1½ years; in five, between the ages of 2 and 3 years. Boys outnumbered girls approximately 2:1. The fact that 50 per cent of the mothers had migraine points to an important hereditary factor. Endogenous psychoses were not noted among the parents. In two cases a paternal uncle was suffering from epilepsy. Many patients had had several of the infectious diseases common to childhood. As a group, the patients were well endowed intellectually; they were affectionate, lively and frequently sensitive.

Gastro-intestinal symptoms, such as vomiting and abdominal pain, were common during the attacks, and these were occasionally accompanied by a rise in temperature. The headaches were often followed by prolonged sleep. Nosebleed was not uncommon; in some cases it probably represented the equivalent of a migrainous attack. Transitory visual symptoms were frequently noted. One patient had ophthalmologic migraine. Two patients complained of transient sensory disturbances. A distinct psychosis was noted in only one patient. The chief symptoms were severe anxiety, excitement and confusion, which lasted for several days. This psychosis was associated with an attack of migraine in a boy aged 13, whose periodic headaches began at the age of 6. In the whole group disturbances in mood were among the most frequent and prominent features of the clinical picture. They were manifested in irritable, peevish and sullen conduct, or less often in seclusive, anxious and tearful behavior. Disturbances in mood were observed before, during and after the paroxysmal headaches, but they also occurred as migrainous equivalents. In a considerable number of instances it was these reactions, rather than headaches, that caused the patients to be brought to the clinic.

ROTHSCHILD, Foxborough, Mass. [ARCH. NEUROL. & PSYCHIAT.]

EPILEPSY OF HYPOTHALAMIC ORIGIN. H. NAKAGAWA, Psychiat. et neurol. jap. **41**:15 (April) 1937.

Nakagawa reports a case of measles encephalitis associated with epilepsy of hypothalamic origin. The patient, a boy, had an attack of measles at 6 years of age. Twenty days later, when the rash began to recede, there developed symptoms of extrapyramidal and hypothalamic involvement. These were ushered in by hypersomnia, followed a week later by psychopathic excitement, twitchlike movements of the body muscles, various compulsive states, peculiar postural anomalies and vegetative disturbances, such as severe salivation and increased section of sweat. In addition, there were attacks characterized by rhythmic and painful flexion movements of the trunk without loss of consciousness, increased secretion of saliva and sweat and apnea followed by severe cyanosis. After these attacks there were decreased muscular tonus and sleep. These attacks occurred from five to twenty times a day and lasted from one to two minutes. The symptoms increased in severity as the dose progressed. After nine months the patient died. The blood and spinal fluid were normal. No autopsy is reported.

ALPERS, Philadelphia. [ARCH. NEUROL. & PSYCHIAT.]

## Psychology and Psychiatry

FUNCTIONAL NERVOUS DISEASES IN CHILDREN. A. HYMANSON, Arch. Pediat. **54**:317 (June) 1937.

Prophylactic treatment against functional nervous disorders in children should begin when a couple decides to marry. They should undergo a rigid health examination, and an investigation should be made of the mental characteristics of their respective families. As a child is the epitome of the physical nature of his parents, it is no wonder that 5 per cent of school children are definitely neurotic. Nervous inheritance is not an incurable condition; with judicious treatment and in certain cases with the help of a trained psychologist the neurosis may be modified and even cured.

ORR, Buffalo, N. Y.

MONGOLOID IMBECILITY IN THE NEGRO. R. B. SCOTT, Arch. Pediat. **54**:410 (July) 1937.

Mongolism occurs in the Negro race more frequently than is commonly supposed. Three cases of mongolism occurring in Negroes are reported, making a total of thirty-six such cases reported to date.

ORR, Buffalo.

THE EFFECTS OF A MIXED INCENTIVE ON THE BEHAVIOR OF RATS. G. C. DREW, Brit. J. Psychol. **26**:120 (Oct.) 1935.

An attempt has been made to study the effect of mixed reward and punishment on an animal's performance of a simple task. Rats were first taught to run to a food box, receiving a reward of food during the learning process. They were then subjected to a mixture of incentive stimuli, a bell being added to a food incentive during part of the time they were in the food box. The effect of the food and that of the bell were ascertained separately on other groups of rats.

The mixture of incentive stimuli produced varying results in individual rats during the first few trials but thereafter gave rise to a quicker performance.

BUDSON, Detroit.

IMAGERY AND LEARNING. ANNIE H. JENKIN, Brit. J. Psychol. **26**:149 (Oct.) 1935.

Research was done with sense and nonsense material, using adults and children from 8 to 14 years of age as subjects. It was found that visual imagery played a small part in the recalls. The majority of the images did not furnish the memory knowledge, but accompanied it. The children, in proportion to the number of possible recalls, gave more instances of visual imagery. Their imagery was of whole figures or objects. However, the children had less correct recalls.

Words were the main medium by which concepts were formed and the medium by which the figures and objects were recalled. Analogies were the main form in which words were used. With the nonsense material the formation of new concepts played an important part in the recalls, but with the sense material the subjects' previous concepts were utilized, and a concept of the set was a modification of a preexisting idea.

For recall of individual items from a series of visual data which fall into classes, photographic visual imagery is of less importance than concepts, the use of analogy, verbal description and commentary. This is independent of whether the individual items are what is called sense or nonsense material.

BUDSON, Detroit.

JUVENILE DELINQUENCY IN NANCY. MEIGNANT, Bull. Soc. de pédiat. de Paris **34**:436, 1936.

Two hundred cases of juvenile delinquency were observed during 1935. They included the usual multiple varieties. Alcoholic, syphilitic and tuberculous heredity were frequent. Practically no definite organic disease was found among the children studied, although many were poor physical specimens. Among the girls acquired syphilis was not observed, but 80 per cent of the older ones had gonorrhea; many of the older boys were given to alcoholism. Binet-Simon intelligence tests showed that 25 per cent were mentally retarded. One was schizophrenic, and 10 per cent were epileptic. As causal factors Meignant cites the fact that 80 per cent came from families in which the parents were dead, not married or separated and the influence of economic depression and unemployment. With proper medicosociojudiciary co-operation and with more money made available to improve the economic lot in the districts from which the majority of juvenile delinquents come, the outlook for improvement should be good.

BENJAMIN, Montreal.

EXPERIENCE CONCERNING THE INHERITANCE OF A CHARACTER. M. MUTEL, Bull. Soc. de pédiat. de Paris **34**:449, 1936.

Acquired characters affect only somatic cells and are not transmitted. If a mutation can be accomplished by affecting the germ cells, the character which results will be hereditary. Rabbit embryos were treated by giving the pregnant mothers 1.5 Gm. of naphthalene in oil per kilogram of body weight. After one or more doses cataracts developed in the eyes of the mothers, and subsequently

all the progeny were born with congenital cataracts. However, after repeated consanguineous matings of these rabbits no offspring with cataract was obtained. This is considered an added bit of evidence confirming the view that any anatomic mutilation which produces an acquired character does not affect the germ cells, and any character so acquired is not hereditary.

BENJAMIN, Montreal.

THE PSYCHIC DEVELOPMENT OF THE CHILD. O. N. DE SOUZA GUIMARAES, Arch. de pediat., Rio de Janeiro **9**:329 (July) 1937.

The various phases of child development are discussed.

SANFORD, Chicago.

PUNISHMENT AS AN AID IN TRAINING THE CHILD. T. HAMBURGER, Med. Klin. **33**:753 (June 4) 1937.

Punishment is indispensable in child training. In general it is of value in teaching prohibitions, but seldom is it of any use in teaching accomplishment. One should never try to elicit obedience to a command in a small child by a slap. A smart slap, a friendly word or a gift applied correctly are more valuable than much talking. Applied incorrectly, they frequently lead to neuroses.

Punishment can be begun about the ninth or tenth month. If a slap is accompanied by a prohibitive utterance as "No! No!" a conditioned reflex will soon be established, so that in most instances only the verbal prohibition will be necessary. The slap must be painful but it must not be regarded as chastisement for an evil deed. It should be considered only as a correction which will help the child to realize which acts are prohibited. The fear that the slap will destroy the child's affection for the person training the child is unnecessary. A child respects a slap as he respects a burn from a hot stove.

After the second year other forms of punishment can be used. Isolation in a corner or in a room or deprivation of a pleasure are appropriate. The child's love of approbation can often be utilized. Depending on the child's disposition, a few smart slaps may be desirable. But as a rule spanking can be dispensed with throughout childhood.

Punishment is usually of no avail for pouting. Isolation, disregard and disparaging speech about the child in the third person are more effective.

SIEMSEN, Chicago.

STUTTERING: NEUROPSYCHIATRIC ASPECT OF THE PHENOMENON. F. GREWEL, Psychiat. en neurol. bl. **41**:16 (Jan.-Feb.) 1937.

The mechanism of stuttering is analyzed from the point of view of the constitutional coordinative and neurotic factors. From a review of the literature Grewel concludes that a constitutional tendency to stuttering can be traced in some cases, although it seems not to play a decisive role. Coordination of speech apparently is of greater importance. Some of the phenomena well known in organic nervous diseases, such as perseveration, reiteration, logoclonia, echolalia and palilalia, show a marked resemblance to stuttering. Considerable difficulty in any analysis arises from incomplete definition of the word "stuttering" as well as of many of the aforementioned organic speech defects. The closest organic parallelism to the phenomenon of stuttering is seen in palilalia. The stuttering factor in palilalia is considered to be cortical. The striatal localization of stuttering is rejected. One of the factors involved in the development of stuttering, especially between the fourth and the sixth year of age, is found in insufficient automatization of speech. The motor component of stuttering is assumed to be analogous to that of subcortical motor aphasia.

These considerations point to the presence of a psychic mechanism. One may think in this connection of the babble of children or of the iteration of primitive languages. Following this trend of thought, one may conceive of stuttering as

an emotionally conditioned regression to a primitive mechanism of speech. Stocker pointed out that stuttering is analogous to ideomotor parapraxia. On the other hand, the stutterer, besides his leading symptom, shows signs which are common in neurotic persons, such as torsion movements of the head, fixation of one point, flushing, blowing out the cheeks, rubbing the hands and folie du doute, uncertainty, timidity and lack of self-confidence. The significance of the neurotic phenomena of stuttering is seen in the wish not to pronounce certain letters. Here the mechanism which forms the basis for the incoordination of speech interferes.

Since stuttering is not a nosologic unit, treatment must be individualized. The importance of general psychic therapy is emphasized. Change of milieu, instruction of parents and building of character are of greater importance than exercise. The personality of the teacher is important. In the presence of deeper conflicts a psychiatrist is necessary.

LEWY, Philadelphia. [ARCH. NEUROL. & PSYCHIAT.]

## Diseases of the Genito-Urinary Tract

OVARIAN TUMORS IN INFANCY AND CHILDHOOD. C. M. WITZBERGER and H. A. AGERTY, Arch. Pediat. **54**:339 (June) 1937.

An ovarian cyst, probably dermoid in nature, was removed from an infant of 16 months. The authors have made a comprehensive review of the literature and submit the following tables to show the pathologic and the age distribution of ovarian tumors.

*Pathologic Distribution*

| Type of Tumor | Weil Series | Downes Series | Loeb and Levy Series | Present Series | Total | Percentage |
|---|---|---|---|---|---|---|
| Simple and multilocular cysts | 19 | 2 | 16 | 23 | 60 | 32 |
| Dermoid cysts | 22 | 8 | .. | 15 | 45 | 24 |
| Teratoma | .. | .. | 9 | 4* | 13 | 7 |
| Hemangioma | .. | .. | .. | 1 | 1 | 0.5 |
| Malignant hypernephroma | .. | .. | .. | 1 | 1 | 0.5 |
| Chorionepithelioma | .. | .. | 1 | 2 | 3 | 1.5 |
| Sarcoma | 15 | Not recorded separately | 4 | 3 | ? | ? |
| Carcinoma | 5 | Not recorded separately | 5 | 15† | ? | ? |
| Combined malignancies | 20 | 16 | 10 | 24 | 70 | 38 |
| Total | 61 | 26 | 35 | 64 | | |
| | | | 186 | | | |

AGE DISTRIBUTION

| Age | Weil Series | Downes Series | Loeb and Levy Series | Present Series |
|---|---|---|---|---|
| Under 1 year | 2 | Downes | 3 | 2 |
| 1 to 2 | 2 | cites | 3 | 5 |
| 2 to 3 | 7 | 26 cases | 3 | 6 |
| 3 to 4 | 3 | but | 3 | 4 |
| 4 to 5 | 7 | does | 3 | 5 |
| 5 to 6 | 4 | not | 3 | 5 |
| 6 to 7 | 1 | list | 3 | 9 |
| 7 to 8 | 11 | ages or | 6 | 3 |
| 8 to 9 | 8 | give | 3 | 11 |
| 9 to 10 | 7 | refer- | 2 | 10 |
| 10 to 11 | 9 | ences | 3 | 4 |
| Total | 61 | | 35 | 64 |

* Three of the reported teratomas were malignant.
† Seven of the reported carcinomas were of the granulosa cell type with pubertas praecox.

While ovarian tumors in infancy and childhood are rare, they occur frequently enough to justify consideration in a differential diagnosis of intra-abdominal conditions at this period of life.

ORR, Buffalo, N. Y.

TORSION OF FALLOPIAN TUBE IN THE VIRGIN. L. L. BLUM and B. E. SAYRE, Arch. Surg. **34**:1032 (June) 1937.

The unusual condition of torsion of the fallopian tube was observed in a white girl 10 years of age. The acute symptoms in the right lower quadrant of the abdomen simulated acute appendicitis, so the preoperative diagnosis of acute appendicitis was made. Appendectomy was done, and the pelvis was explored. The black mass that was revealed was found to be the right fallopian tube, which had twisted on itself with three complete turns. This is the fourth recorded case occurring in a girl who had not yet menstruated. The literature dealing with this subject is thoroughly discussed, with the theories as to what leads to the occurrence.

KAISER, Rochester, N. Y.

SUBCUTANEOUS PYELOGRAPHY IN CHILDREN. R. C. TRAVIS, J. Indiana M. A. **30**:282 (June) 1937.

In small patients, in whom intravenous pyelography is difficult, subcutaneous injection of the pyelographic medium, diluted with 4 volumes of distilled water, was employed in eighteen patients with no untoward reactions.

MILLER, South Bend, Ind.

RATE OF EXCRETION AND BACTERICIDAL POWER OF SULFANILAMIDE (PRONTYLIN) IN THE URINE. H. F. HELMHOLZ and A. E. OSTERBERG, Proc. Staff Meet., Mayo Clin. **12**:377 (June 16) 1937.

Sulfanilamide given orally renders the urine strongly antiseptic for all organisms commonly found in urinary infections except Streptococcus faecalis. The conjugated form is more effective than the free. It is more effective in alkaline than in acid urine.

MILLER, South Bend, Ind.

RENAL EXTRAVASATION AND REFLUX. A. R. C. HIGHAM, Brit. J. Surg. **25**:139 (July) 1937.

In this article Higham briefly describes the various theories and the experimental work that has been done for and against pyelovenous backflow. At the present time it is believed that the angle of the fornix calicis is the determining factor, an acute-angled fornix tending to produce rupture of the pelvis (sheep and rabbit) and an obtuse angle a tubular backflow (pig, dog and horse). The kidney of man seems to hold an intermediate position.

In man, tubular backflow cannot occur against secretory pressure. Probably most of the extravasated fluid evidenced in retrograde pyelograms enters the venous system at once. However, the possibility of lymphatic backflow must be kept in mind. Roentgenographically the pyelovenous backflow appears as fine lines running irregularly from the shadow of the kidney to that of the vertebral column. If tubular backflow occurs there is a roentgenographic picture of short brushlike radiations, which may extend into the cortex.

SUMMERFELDT, Toronto, Canada.

A CASE OF PSEUDO-HERMAPHRODITISM AND ITS TREATMENT. E. L. H. ELLIS, Lancet **2**:17 (July 3) 1937.

An apparently normal girl of 7 years was admitted to the hospital for a swelling in each groin, said to have been noticed first a year before, following a fall. These swellings were diagnosed as reducible inguinal hernias. At operation an undescended testis of normal size with a clearly defined vas deferens was found on each side in addition to the hernial sac. Bilateral orchidectomy was performed. The pelvis showed normal female characteristics, with normal mons pubis, labia, clitoris and hymen.

On laparotomy no signs of the uterus, uterine tubes or ovaries were found.

The object of the paper is to suggest that in a case of pseudo-hermaphroditism in which the external genitalia and the patient's perspective are essentially feminine, treatment should be directed toward the continuance of the patient's present status, always with a view to future development of untoward sex characteristics.

LANGMANN, New York.

LIMITS OF NORMAL IN UROLOGIC CONDITIONS DURING CHILDHOOD. A. OBERNIEDERMAYER, Ztschr. f. Kinderh. **58**:581 (March 20) 1937.

Pyelography may show a difference in the two sides which is yet within normal limits, or it may represent a temporary condition suggestive of pathologic change. A urologic diagnosis should not be made on one roentgenogram. Case reports and fourteen roentgenograms are presented.

SIEMSEN, Chicago.

CONGENITAL URETHRAL VALVES. H. E. SHIH and G. Y. CHAR, Chinese M. J. **52**:19 (July) 1937.

The authors report five male children with difficult urination and persistent infection of the urine since birth due to congenital valvular obstruction of the posterior urethra. Cysto-urethrography is of valuable assistance in diagnosis. Such children are brought to the hospital because of retention of urine. The writers have found Young's transurethral punch operation the most satisfactory treatment.

NEFF, Kansas City, Mo.

TREATMENT OF INFLAMMATION OF THE PELVIS AND BLADDER BY AMMONIUM MANDELATE. C. L. DE JONGH, Nederl. tijdschr. v. geneesk. **81**:2721 (June 12) 1937.

A description is given of the treatment of inflammatory conditions of the renal pelvis and bladder with ammonium mandelate. The results obtained in twenty patients are recorded. Defective renal function is a contraindication; if there is retention of urine, the results are unsatisfactory. A warning is given against the risks of diagnosing pyelitis when the condition is pyonephrosis, renal calculus or renal tuberculosis.

VAN CREVELD, Amsterdam, Netherlands.

## Diseases of the Ductless Glands; Endocrinology

EXOPHTHALMIC GOITER IN CHILDREN. I. BRAM, Arch. Pediat. **54**:419 (July) 1937.

Of approximately 5,000 cases of exophthalmic goiter, 128 (2.5 per cent) occurred in children under 12 years of age.

The youngest patient was 25 months old. Older children were more frequently afflicted than the very young.

The ratio of females to males was 16:1.

*Incidence of Exophthalmic Goiter in Children of Twelve Years or Younger According to Age*

| Cases | | |
|---|---|---|
| Number | Percentage | Age |
| 26 | 20.3 | 10 to 12 |
| 32 | 25.0 | 9 to 10 |
| 24 | 18.6 | 8 to 9 |
| 17 | 13.3 | 7 to 8 |
| 11 | 8.7 | 6 to 7 |
| 8 | 6.3 | 5 to 6 |
| 5 | 3.9 | 4 to 5 |
| 3 | 2.3 | 3 to 4 |
| 2 | 1.6 | 2 to 3 |
| Total 128 | 100.0 | |

Infection of teeth and tonsils was apparently related to the incidence of the disease in 50 per cent of the cases. The exciting cause in 22 per cent was attributed to general infections. In 12 per cent a simple colloid or hypertrophic thyroid was held responsible, and in 6 per cent psychic trauma contributed as an exciting cause.

Enlargement of the thyroid gland, exophthalmos, tachycardia, nervousness and tremor, gastro-intestinal symptoms, loss of weight and augmentation of height were the most frequent findings.

In the experience of the author the exciting cause of goiter in adults was usually a psychic trauma, while in children it was commonly a focal or a general infection.

The symptoms in children, especially thyroid swelling, exophthalmos, tachycardia and nervous phenomena, are somewhat exaggerated as compared with those in adults.

Since children need the entire thyroid for growth, conservative treatment was employed. Elimination of foci of infection, a diet low in animal protein, rest and psychotherapy of a type that dominates the patient and household should effect recovery in the average patient within several months.

ORR, Buffalo.

EFFECTS OF HYPOPHYSEAL IMPLANTS FROM NORMAL MATURE GUINEA PIGS ON THE SEX ORGANS OF IMMATURE GUINEA PIGS. I. G. SCHMIDT, Endocrinology **21**:461 (July) 1937.

To determine the ganodatropic activity of the guinea-pig's pituitary gland, hypophyses from normal animals in different stages of the estrous cycle were implanted in immature guinea-pigs. Varying responses were observed in the ovaries, uterus and vagina, depending on the time before, during or after estrus at which the hypophyses were obtained from the donors. The results can probably be explained by the fluctuation in the amount of follicle-stimulating substance in the pituitary, influenced perhaps by a slight inhibitory effect of the substance produced by the eosinophils.

JACOBSEN, Buffalo.

EFFECTS OF HYPOPHYSEAL IMPLANTS FROM GUINEA PIGS WITH IRRADIATED OVARIES ON THE SEX ORGANS OF IMMATURE GUINEA PIGS. I. G. SCHMIDT, Endocrinology **21**:469 (July) 1937.

In previous communications Schmidt described changes in the gonads of guinea-pigs following irradiation of the ovaries with roentgen rays. Although the structure of most of these irradiated ovaries was altered greatly, there was reason to assume that a part of their normal function was retained, namely, the secretion of estrogen. This assumption was tested by a study of the urinary excretion of estrogen; since estrogen was found in the urine, the amount excreted was compared with that excreted by normal animals, and at the same time the effects of implantation of hypophyses from such irradiated animals were compared with the effects of implantation of hypophyses from normal animals.

Following irradiation with a minimal sterilization dose of roentgen rays, the ovaries of some animals functioned normally, but the follicles were few, the estrous cycles were slightly disturbed in length, and the vaginal smears were indefinite. Implantation of the hypophyses from these animals produced responses similar to those following implantation of the hypophyses of normal animals in corresponding stages of the estrous cycle.

After irradiation the normal structure of the majority of the ovaries was replaced by an "interstitial gland" structure, without follicles, except for an occasional developing or growing one, and without corpora lutea. Estrous cycles occurred irregularly, with prolonged estrous periods, characterized by excessive desquamation of cornified cells or all types of cells associated with vaginal estrus. Excretion of estrogen in the urine was usually less than during a normal estrous period.

JACOBSEN, Buffalo.

EXCRETION OF GONADOTROPIN BY NORMAL HUMAN MALES AFTER THE INGESTION AND INJECTION OF EXTRACTS OF PREGNANCY URINE. M. H. FRIEDMAN and G. L. WEINSTEIN, Endocrinology **21**:489 (July) 1937.

The recent finding in plants of a substance stimulating gonadotropic activity prompts a question of the importance of such plants in nutrition and their possible physiologic significance relative to the secretion of a gonadotropic factor by the pituitary. If such plant gonadotropins are of physiologic significance, one might expect that on ingestion they would produce some biologic effect or lead to an increased rate of formation of the pituitary gonadotropic factor. In the latter event an increased urinary elimination of gonadotropic substance might reasonably be anticipated in view of the readiness with which the mammalian kidney excretes the gonadotropic substance prepared from the urine of pregnant women. However, one might just as reasonably expect similar results from the oral ingestion of large amounts of the latter gonadotropic substance. With such questions in mind the present experiments were conducted.

By the methods employed in these experiments it was impossible to detect any augmented excretion of gonadotropic substance following oral ingestion of from 8,000 to 40,000 units of the gonadotropic substance from the urine of pregnant women. Similarly, it was impossible to detect any augmented excretion of gonadotropic substance following intramuscular injection of 480 rat units of the gonadotropic substance from the urine of pregnant women. Repeated injections of larger doses of this substance led to the excretion of variable fractions of the injected material, not exceeding 20 per cent.

JACOBSEN, Buffalo.

LIPOMATOSIS IN INSULIN-INJECTED AREAS IN A DIABETIC BOY, AGED THIRTEEN AND ONE-HALF YEARS. G. B. BADER and F. VERO, J. Pediat. **10**:185 (Feb.) 1937.

Lipodystrophies or atrophies following injections of insulin into the same areas over a long period of time have been reported frequently. Only recently have lipoma-like masses in such areas been reported. The authors cite an instance of such subcutaneous tumefactions in a 13½ year old diabetic boy who, despite admonitions to the contrary, injected insulin into the same areas over a period of two years because "it hurt less" in these areas. These tumefactions occurred over the biceps, in both buttocks and in the anterior surfaces of the thighs, and varied in size from that of a hen's egg to that of a fist. The tumefactions were hemispheric, raised above the surface of the skin, soft and freely movable but adherent to the skin. The insulin appeared to be absorbed well from these areas. Macroscopic and microscopic examination of the lipomatoses showed that they were due primarily to hyperplasia and hypertrophy of the subcutaneous fat with a moderate amount of older and recent inflammatory reaction. The sole therapy is one of prevention, avoiding the use of the same site for injections of insulin. The tumefactions will decrease somewhat in size when these areas are no longer used for injections of insulin.

The literature is reviewed and the various theories as to the etiology are given. The precise etiology is unknown.

RAUH, Cincinnati.

ENDOCRINE OBESITY IN CHILDREN: CLINICAL AND LABORATORY STUDIES AND RESULTS OF TREATMENT. M. B. GORDON, J. Pediat. **10**:204 (Feb.) 1937.

Gordon believes that obesity in children is most frequently a result of endocrine disturbances and not of overeating per se. These disturbances most frequently are hypothyroidism and hypopituitarism. A classification of these disturbances and a table for differential diagnosis between thyroid and pituitary types of obesity are given. This table includes consideration of the history, the results of physical examination, the bone development, the basal metabolism, the specific dynamic action, the blood chemistry and the salt and water retention.

Fifty children (twenty-nine boys and twenty-one girls) with endocrine obesity were studied and were observed for at least six months to one year. An analysis of the observations follows.

The etiologic factors represented in the series are: (1) hypopituitarism in 86 per cent (primary in 48 per cent, with secondary hypothyroidism in 38 per cent); (2) hypothyroidism in 12 per cent (primary in 8 per cent, with secondary hypopituitarism in 4 per cent); (3) hypogonadism (primary female) in 2 per cent.

Obesity from hypopituitarism with or without secondary hypothyroidism is more frequent than that primarily due to hypothyroidism or hypogonadism in childhood.

A birth weight of 8 pounds (3,629 Gm.) is found with either the pituitary or the thyroid type. A child with the former tends to lose weight early and gain later. In the pituitary type there may be a steady gain in weight, a decrease and then an increase or sudden spurt in weight during childhood or at puberty.

A relationship between the onset of obesity and the occurrence of an acute illness, operation or trauma was found in thirty-three cases. The average overweight in this series was found to be 44.4 per cent on the basis of height for age as compared with Baldwin's standard. The majority of the children were of average normal height.

Sexual development was retarded in twenty-seven boys. Cryptorchidism was present in five unilaterally and in seven bilaterally. Menstrual disturbances were present in nine girls of postpubertal age, including one with primary eunuchoidism.

On the basis of actual weight, a basal metabolic rate below minus 10 was noted in 55 per cent, between plus 10 and minus 10 in 41 per cent and above plus 10 in 4 per cent. The specific dynamic action was found to be diminished. The average specific dynamic action in this series was 4.1 per cent; in 79 per cent of the cases it was below 10, and in 42 per cent zero.

Blood chemistry studies indicated that with endocrine obesity chlorides and uric acid are high, cholesterol high normal (depending on the degree of accompanying hypothyroidism), sugar low and urea nitrogen and creatinine normal. Salt and water retention were present in the majority of cases.

The treatment in this series included prescription of a diet low in calories, i. e., high in proteins and low in fat and carbohydrates; restriction of the salt and water intake; oral administration of desiccated thyroid and anterior pituitary gland substance; hypodermic injection of an extract of the anterior lobe of the pituitary gland and hypodermic injection of extract of the urine of pregnant women or of an estrogen in cryptorchidism, menstrual disorders and protracted hypogonadism.

The results of treatment were: reduction in weight to normal or to within 10 per cent overweight for height and age on the basis of accrued height; redistribution of fat to a more normal allocation; a general increase in height; an average increase in the basal metabolic rate of from 8 to 5; an increase in specific dynamic action, and improvement in hypogonadism and cryptorchidism, which were influenced to a greater extent than menstrual disorders. The results in the basal metabolic rate, specific dynamic action, obesity and sex development were generally, but not always, parallel.

RAUH, Cincinnati.

CHOLINE-ESTERASE ACTIVITY OF HUMAN SERA, WITH SPECIAL REFERENCE TO HYPERTHYROIDISM. W. ANTOPOL, L. TUCHMAN and A. SCHIFRIN, Proc. Soc. Exper. Biol. & Med. **36**:46 (Feb.) 1937.

The acetylcholine esterase activity of the serum was determined for 500 persons, including both normal persons and persons with pathologic conditions, using a modification of the Ammon gasometric method. In untreated hyperthyroidism the acetylcholine esterase values were relatively high. It is suggested that the activity of this enzyme may be one of the elements related to the so-called sympathicotonicity or vagotonicity of a person.

HONSEN, Minneapolis.

A Study of Cretinism in London. A. Lewis and Others, Lancet **1**: 1505 (June 26) 1937; **2**:5 (July 3) 1937.

This study was originally undertaken to determine the psychologic effects of thyroid deficiency in childhood and the benefit of substitution therapy in regard to the mental retardation.

Seventy-nine patients who had been treated for cretinism were examined. Detailed psychologic tests showed that it is possible for cretins to become mentally normal. Promptness and continuity in the administration of thyroid were apparently not the only deciding factors in the prognosis. A few whose intelligence quotients were normal had had inadequate treatment and vice versa. The records of many of the patients were incomplete, which detracts appreciably from this study.

Langmann, New York.

Chrysotherapy in Rheumatoid Arthritis. L. J. A. Parr and E. A. Shipton, M. J. Australia **1**:864 (June 5) 1937.

In the series of seventy cases reported by the authors untoward reactions occurred in eighteen. Reactions were four times as frequent in the female as in the male patients. Five of the eighteen reactions took the form of hemorrhage; there was one fatal blood dyscrasia; there were ten skin reactions, including two of exfoliative dermatitis; and there were four involvements of the mucus membranes, one combined with a skin reaction. As to the results of the therapy, five patients were cured and thirty-five greatly improved. A comprehensive review of the general subject of chrysotherapy is presented.

Gonce, Madison.

Dystrophic Infantilism. J. Huber, J. Delon, É. Bivy and S. Thieffry, Bull. Soc. de pédiat. de Paris **34**:321, 1936.

A boy 16 years old showed infantilism resembling the Lorain type. No definite cause could be found for the condition, and no efficacious treatment was administered.

Benjamin, Montreal.

Relation of the Thymus to the Endocrine Function of the Pancreas. G. C. Bentivoglio, Riv. di clin. pediat. **35**:577 (July) 1937.

Bentivoglio reports the case of an infant with hypertrophied thymus and symptoms of thymic asthma. The blood sugar curves were determined following ingestion of sugar and giving of epinephrine, both before and after roentgen therapy. The abnormality of these curves suggested that there had been some disturbance of the function of the island tissue in the pancreas. The child died several months later of acute bronchopneumonia. At postmortem examination the thymus showed atrophy, and the island tissue of the pancreas, definite hypertrophy and hyperplasia. On the basis of this case Bentivoglio speculates on the influence of the thymus on the metabolism of sugar through its interrelation to the pancreas and the hypophysis.

Higgins, Boston.

A Case of Hypophysial Infantilism. B. Nunan, J. de pediat., Rio de Janeiro **4**:252 (June) 1937.

The girl was 9 years of age and weighed 11 kilograms. Photographs are shown.

Sanford, Chicago.

Carcinoma of the Hypophysis in a Nine Year Old Boy. E. Wentzler, Monatschr. f. Kinderh. **69**:86 (Feb.) 1937.

At the age of 5 a boy began to show symptoms of diabetes insipidus, which progressed in spite of all treatment. At the age of 9 he died. Autopsy showed an

entire absence of functioning tissue in the posterior lobe of the hypophysis, with some involvement of the pars intermedia. Presumably, the destruction of tissue was so great that the dosage of posterior pituitary prescribed was insufficient to control the clinical picture. GERSTLEY, Chicago.

DIABETES IN CHILDREN. R. WAGNER, Wien. klin. Wchnschr. **50**:165 (Feb. 5) 1937.

Since 1923 Priesel and Wagner have made a study of 200 diabetic infants and children. They have had good results from the use of a diet of small to medium amounts of carbohydrates and large amounts of fat, which they consider on a par nutritionally with a diet rich in carbohydrates (although the latter may appeal more to the child's appetite). They account for the similar results on the ground that both diets provide sufficient calories to prevent undernourishment, while the insulin compensates for any difference in the metabolic processes, more insulin being required in the case of the heavier carbohydrate intake.

A diet low in calories is recommended at the beginning of treatment in every case of diabetes in a child, since this always brings about some improvement. It has been found helpful also later in the treatment when metabolic disturbances occur.

Normal physical and mental development was the rule during the course of the disease in the cases in question. Infantilism, especially among boys, is not uncommon but tends to disappear during the first year of treatment. If it does not, so-called insular infantilism has developed as a result of neglect of the disease over a period of years. Early and persistent care are necessary to prevent this and other effects of diabetes. The special diet and injections of insulin, of course, should follow the physician's orders in exact detail.

The average twenty-four hour insulin requirement for a totally diabetic person during puberty and the years immediately following is about 80 units. The daily blood sugar curve in such a patient fluctuates widely. During the hours of fasting, the sugar values are very high and only a midday injection prevents extreme hyperglycemia.

The common cause of death in diabetes is coma, and tuberculosis is probably the most serious complication of the disease, especially in patients between 12 and 20, an age at which even persons in normal health would be endangered by a primary tuberculous infection. If coma occurs, the diabetic child can still be saved in most cases; one case is reported in which the blood sugar test showed 1,430 mg. per hundred cubic centimeters, but the hyperglycemia yielded to 360 units of insulin.

Of 170 surviving patients in the series, all have attained good health. They can engage in any work that does not interfere with observation of the rules for diet and the injections of insulin. Manual labor is not only permissible but generally desirable.

From the eugenic standpoint, diabetic parents are liable to have a diabetic child. However, as in other recessive hereditary diseases, the latent tendency often cannot be discovered, and in many cases of diabetes in childhood there is a negative family history (70 per cent in the present series). ABT, Chicago.

INVESTIGATIONS OF STRUMA AT MODUM, NORWAY. O. DEVOLD, F. BATT, K. CLOSS and J. BACKER, Norsk mag. f. lægevidensk. **98**:899, 1937.

In the southeast part of Norway, at Modum, which is a district in which struma is prevalent, 4,560 persons were examined, and struma was found in 65.6 per cent. In school children struma was particularly frequent. The same was true of women between the ages of 20 and 29 years and especially of those who had given birth to children.

The content of iodine in twenty-four hour specimens of urine was found to average 23.4 micrograms for this district, while an average content of 35 micro-

grams was found for Oslo and surroundings, where hardly any struma is seen. The average figure for drinking water was 0.69 microgram per thousand cubic centimeters in the district where struma occurs frequently and 1.56 micrograms for Oslo.

The authors recommend prophylactic use of iodized sodium chloride as most practical in this district. TOVERUD, Oslo, Norway.

## Diseases of the Muscles, Bones, Joints and Lymph Glands

HYPEROSTOSIS CRANII ASSOCIATED WITH INTERNAL HYDROCEPHALUS AND METABOLIC DISTURBANCES. D. I. ARBUSE, Arch. Pediat. **54**:323 (June) 1937.

A colored girl of 15 years was observed with hyperostosis cranii. In addition, the patient had an internal hydrocephalus and diabetes of central origin. Mentally she was markedly retarded. In a review of the literature this patient was found to be the youngest whose case has been reported. ORR, Buffalo, N. Y.

OSTEOPOROSIS MELOLYTICA (MULTIPLE SPONTANEOUS IDIOPATHIC SYMMETRICAL FRACTURES). J. C. LEEDHAM-GREEN and F. C. GOLDING, Brit. J. Surg. **25**:77 (July) 1937.

The authors draw attention to an uncommon type of skeletal dystrophy and cite a case which came under their observation. Essentially, the disease consists of generalized osteoporosis associated with more or less symmetrical pathologic fractures, which develop gradually from small localized areas of more intense decalcification. The calcium balance is normal, and the etiology is unknown, being apparently not dietetic or concerned with internal glandular dysfunction.

Roentgenologically the characteristic features are, first, local symmetrical lesions resembling fractures and, second, general osteoporosis of all bones. The importance of the latter is not known, as it was not mentioned in the two previous descriptions.

The local lesions appear either as small circular areas of osteoporosis, as seen in the skull and in the earliest changes in the long bones, or as translucent bands which appear to spread gradually across the bone or, more probably, around the circumference, eventually leading to the solution of continuity. The edges of the bone at the site of the fracture are irregular. Immediately above and below the fracture the bone is normal in appearance. Except in the second metatarsals, there was no evidence of reaction or of attempt at healing. A suggestion of sclerosis was noticed around the punctate areas in the early stage of the lesion, but otherwise the disease appeared to be entirely destructive. Callus formation did not occur.

The diagnosis of the condition depends entirely on the roentgenologic appearances of the bones, and in this connection the importance of roentgenograms of the whole skeleton cannot be overemphasized, especially as the roentgenologic lesions do not necessarily correspond with the sites of pain.

The early symptoms which are common to these cases are: (1) pain across the lower part of the back, (2) momentary hesitation before starting to walk and (3) waddling gait.

The characteristic features demonstrable in the roentgenograms may be tabulated as follows: 1. Long bones and flat bones are involved. 2. The lesions tend to be symmetrical, but they are not necessarily so and may be more advanced on one side of the body than the other. 3. The lesions appear as circular areas of calcium deficiency, or as translucent bands spreading transversely across the shafts of the bones and gradually leading to fractures. 4. There is little or no callus formation. 5. Displacement at the site of fracture occurs only in the very late stages of the disease. 6. There is no bending of the bones.

The course of the condition is progressive, and the patient is usually confined to bed seven or eight years after the onset of symptoms. Large doses of vitamin D have had no effect.

SUMMERFELDT, Toronto, Canada.

A CRANIAL DEFECT IN AN INFANT. COFFIN and BAILLEUL, Bull. Soc. de pédiat. de Paris **34**:278, 1936.

A boy 18 months old showed a large defect in the right parietal region of the skull, where pulsation of the brain could be felt. He had fallen at the age of 10 months, and soon afterward a large swelling appeared in this region, which gradually disappeared. The question of a congenital defect is mentioned, but it is considered more likely that the condition was a result of trauma. In the absence of symptoms, a protective cap was advised to be worn over the defect, as opposed to immediate bone grafting.

BENJAMIN, Montreal.

SACRO-COCCYGEAL TERATOMA. A. MARTIN, É. and H. ARNAL, Bull. Soc. de pédiat. de Paris **34**:282, 1936.

A girl 19 months old had a large mass extending over both buttocks. It caused no symptoms. Roentgenologic examination showed no abnormality of the bones of the lower part of the spine and pelvis. The tumor was excised. Grossly it appeared polycystic, and histologic sections revealed the multiplicity of tissues characteristic of teratoma. There was no evidence of malignancy.

BENJAMIN, Montreal.

LUMBOSACRAL MALFORMATION: SPONDYLOLISTHESIS OF THE FIFTH LUMBAR VERTEBRA ACCOMPANIED BY BILATERAL SPONDYLOLYSIS IN A BOY OF FIFTEEN YEARS SHOWING LORDOSCOLIOSIS. C. RŒDERER, Bull. Soc. de pédiat. de Paris **34**:286, 1936.

A 15 year old boy walked with difficulty and had lordoscoliosis of the lower part of the spine. Roentgenologic examination revealed spina bifida occulta of the fifth lumbar vertebra and sacrum and a slipping forward and rotation of the fifth lumbar vertebra. He had no pain. He was put up in a plaster cast for months. Immobilization by means of bone grafts was to be considered later if necessary.

BENJAMIN, Montreal.

VERTEBRAL OSTEOCHONDRITIS ASSOCIATED WITH CONGENITAL FRAGILITY OF THE BONES. C. RŒDERER, Bull. Soc. de pédiat. de Paris **34**:311, 1936.

A girl, who was first examined at the age of 2 years, was presented when 7 years old. She could not walk. She had had three spontaneous fractures, two of the upper part of the right femur and one of the lower part of the left femur. Rontgenologic examination showed that a lesion which had originally been suspected to be Pott's disease of the fifth dorsal vertebra had completely cleared up. It was therefore concluded that osteochondritis had been present.

BENJAMIN, Montreal.

CHONDRODYSTROPHY RELATED TO OLLIER'S DYSCHONDROPLASIA. H. WALTRIGNY and N. NEIMANN, Bull. Soc. de pédiat. de Paris **34**:410, 1936.

A girl 25 months old had begun to complain of pain on walking or standing when 19 months old, and later walking and standing became impossible. Gradually deformities of the hands, knees, elbows and fingers appeared. Marked roentgenologic changes of the long bones were present. It is believed that this condition fits into the category of Ollier's disease.

BENJAMIN, Montreal.

MALIGNANT LYMPHOGRANULOMATOSIS WITH PALPEBRAL TARSAL INVOLVEMENT. P. ARMAND-DELILLE and J. BOYER, Bull. Soc. de pédiat. de Paris **34**:534, 1936.

A boy 11 years old had had enlargement of the cervical glands since the age of 7. Biopsy revealed Hodgkin's disease. The liver was markedly enlarged. The spleen was hardly palpable. There was no eosinophilia or pruritis. Renal insufficiency occurred before death. The tuberculin test was repeatedly negative. An unusual feature was involvement of the tarsal areas of the eyelids, of which the skin and mucous membrane appeared normal.

BENJAMIN, Montreal.

STILL'S DISEASE. B. DE LUCA, Méd. inf. **8**:200 (July) 1937.

In a boy born in 1919 Still's disease developed in December 1924. He has been under medical supervision up to the present time. De Luca believes that only those cases of chronic arthritis in which the three characteristic signs—arthropathy, adenopathy and splenomegaly—are observed should be included under the clinical entity of Still's disease.

HIGGINS, Boston.

## Diseases of the Eye

UNILATERAL CONGENITAL ANOPHTHALMOS WITH ORBITOPALPEBRAL CYST. M. ROSENBAUM, Am. J. Ophth. **19**:1101 (Dec.) 1936.

Rosenbaum reports a case of congenital anophthalmos of the left eye associated with an orbitopalpebral cyst. The cyst was removed and examined pathologically. Roentgen examination revealed rudimentary frontal sinuses; the left orbit was smaller than the right, the eye showed a cataract, and there was an irregularity of the optic foramen on the left. The right eye was normal. The author discusses the origin of these defects and states the following conclusion: "Every idiogenetic malformation has its ontogenetic characteristics, which are inherent in its gametes. It is important to note that such an embryonal end result is not pathological, but only differentiated, as a result of arrest of development."

REESE, Philadelphia. [ARCH. OPHTH.]

LESIONS OF THE FUNDUS IN ESSENTIAL HYPERTENSION AND IN ARTERIAL AND RETINAL DISEASE. M. COHEN, Arch. Ophth. **17**:994 (June) 1937.

Among the twenty-six cases discussed by the author, there were two in children. A girl aged 10 years had a history of headaches and high blood pressure for three years. There were a slight amount of albumin and a few red cells in the urine. The urea nitrogen of the blood amounted to 11.2 mg. per hundred cubic centimeters. The spinal fluid was under increased pressure. The blood pressure was 190 systolic and 150 diastolic. Edema and nephritis developed, and the child died. There were bilateral papilledema, engorgement of the retinal veins, contraction of the arteries and a star figure in the macular area.

A boy aged 12 years had acute ethmoiditis and sphenoiditis of the right side. The vision of the right eye was reduced to counting fingers. The disk and surrounding area were markedly edematous, the veins engorged and the arteries contracted. There was a star figure in the macular area. The general physical examination gave negative results. Following an operation on the sinuses the disk was slightly pale, the vessels returned to normal caliber, and the star figure disappeared.

WESCOTT, Chicago.

RELATION OF INCLUSION BLENNORRHEA TO SWIMMING-BATH CONJUNCTIVITIS AS DETERMINED BY AN ACCIDENTAL TRANSMISSION. L. A. JULIANELLE, Proc. Soc. Exper. Biol. & Med. **36**:617 (June) 1937.

A nurse was accidentally inoculated with material from an 11 day old infant who had conjunctivitis. The presence of inclusions in the smears from the infant

and the adult and the results of injections into monkeys indicate to the author that inclusion blennorrhea and swimming bath conjunctivitis are essentially the same disease, the former representing the conjunctival response of the infant, the latter the conjunctival response of the adult, to the same etiologic agent.

HANSEN, Minneapolis.

ORBITOPALPEBRAL RHABDOMYOSARCOMA. MONBRUN and G. OFFRET, Bull. Soc. d'opht. de Paris, February 1937, p. 78.

Muscular tumor is rare and one of the orbitopalpebral junction is an exception. The literature contains few reports of muscular tumor about the eye. In 1924 Redslob reported three cases of such a tumor. Mayer, Lopez-Henriquez and Cardenas Pupo found tumor of the lids. Mier reported a case of rhabdomyoma of the orbit. Monbrun and Offret removed a mass from the right palpebro-orbital junction in a child 9½ years old. The tumor grew so rapidly that the palpebral opening was greatly enlarged. Application of radium was of no avail in stopping the progress of the growth. A photograph of the child shows the tumor, and a drawing demonstrates the histologic structure of the removed tissue. The results of macroscopic and of microscopic examination are outlined in detail. Four types of cells were noted: (1) fusiform cells, which were greatly increased in number; (2) young muscle fibers, which were seen in great abundance and were very long; (3) a double striation of ordinary muscle fibers, and (4) abnormal cells—round cells with chromatin of various coloration. The authors conclude that the tumor had its origin in the superior oblique muscle.

MAYER, Chicago. [ARCH. OPHTH.]

A POSSIBLE FAMILIAL CONNECTION BETWEEN A CERTAIN BLOOD GROUP AND HEREDITARY PIGMENTARY DEGENERATION OF THE RETINA. R. TERTSCH, Klin. Monatsbl. f. Augenh. **97**:585 (Nov.) 1936.

Tertsch attempted to find whether a law exists by which a disposition to a certain hereditary disease may be predicated of a certain person prior to the development of symptoms. After discussing the significance of certain blood groups and adducing a number of genealogies, the author arrives at the following conclusions:

It is likely that in "direct" brothers and sisters a connection exists between hereditary degeneration of the retina and affiliation to a certain blood group. However, this disease is not connected with a definite blood group but may occur with any blood group, as evidenced by data in the genealogies. The afflicted children studied belonged to the same blood group, while the homozygotically healthy children belonged to another blood group. Furthermore, the phenotypically healthy but heterozygotically diseased children belonged to the same blood group as the homozygotically diseased ones.

The practical value of this research is that it may afford an answer to the question whether a division is possible between hereditarily healthy persons and persons with a disposition to hereditary disease for the sake of preventing hereditarily diseased offspring. Examination of other families with hereditary pigmentary degeneration of the retina as to the blood groups to which they belong would further the solution of this problem.

STOLL, Cincinnati. [ARCH. OPHTH.]

## Skin Diseases; Allergy

ALLERGY IN CHILDREN. H. J. RINKEL, Arch. Pediat. **54**:349 (June) 1937.

An analysis of the findings in twenty-five children with asthma, twenty-five with hay fever and twenty-five with perennial nasal allergy is compared with an analysis of the findings in similar numbers of adults with the same diseases. The comparison fails to support the assumption that food is a more common cause of asthma in the child than it is in the adult.

ORR, Buffalo, N. Y.

LIMITATION OF PASSIVE TRANSFER IN FOOD-SENSITIVE CHILDREN. R. CHOBOT and G. HURWITZ, J. Allergy **8**:427 (July) 1937.

Protocols of thirty-eight patients showing the results of 217 direct and indirect tests, with clinical verification, are given. The authors' conclusions are:

1. Reagins may frequently be demonstrated in the serums of food-sensitive children with no corresponding clinical manifestations of allergy.

2. Clinical symptoms of allergy may be present with an apparent absence of reagins.

3. The presence of circulating reagin is not diagnostic per se of clinical allergy.

HOYER, Cincinnati.

ANAPHYLAXIS AND VITAMIN C. J. VAN NIEKERK, J. Allergy **8**:446 (July) 1937.

The experiments were conducted on guinea-pigs; horse serum was the anaphylactogen and the sodium salt of l-cevitamic acid was the vitamin C solution.

Avitaminosis C has no influence in creating anaphylactic sensitization. Vitamin C has no protective action against symptoms of shock nor does the addition of vitamin C to horse serum have any effect on the anaphylactic action of the serum.

HOYER, Cincinnati.

EFFECTS OF ADRENALIN ON SKIN REACTIONS. O. SWINEFORD JR. and P. T. GROVE, J. Allergy **8**:475 (July) 1937.

Single (1 cc.) doses of epinephrine will reduce the intensity of cutaneous and intracutaneous skin reactions to some of the common allergens. The maximal effects occur in from fifteen to thirty minutes. The effects do not last longer than one hour.

There is no correlation between the effects of epinephrine on skin reactions and those on the blood pressure and the pulse.

HOYER, Cincinnati.

TREATMENT OF SERUM SERVING TO REMOVE ITS SERUM-SICKNESS-CAUSING ACTIVITY. L. R. JONES and M. D. FLEISHER, Proc. Soc. Exper. Biol. & Med. **36**:621 (June) 1937.

The principle in serum (normal or immune) which causes serum sickness is destroyed by addition of adequate quantities of alkali or of acid to the serum and exposure of the mixture to heat and subsequent neutralization. Rabbits given injections of serum treated in this way did not show signs of serum sickness, whereas six of ten rabbits given the untreated serum presented symptoms.

HANSEN, Minneapolis.

VACCINE TREATMENT OF ACNE. M. A. GOHAR, J. Egyptian M. A. **20**:253 (June) 1937.

This article puts on record fifteen cases of acne in which the author employed treatment with autogenous vaccines. The results were favorable in some, disappointing in others. One case in which pure cultures of Bacillus coli instead of the usually associated Staphylococcus pyogenes-albus were obtained is reported more in detail. The cultural response was so impressive that the author has the temerity to suggest the inclusion of this organism in subsequent vaccines, whether it is isolated or not.

MULHERIN, Augusta, Ga.

RESULTS OF THE TREATMENT OF ECZEMA IN INFANTS WITH BCG. P. WORINGER. Bull. Soc. de pédiat. de Paris **34**:442, 1936.

The statement is made that infantile eczema improves for a short time after acute infection but often remains cured after chronic infection. Seventy-seven

infants with eczema were given BCG subcutaneously; at first a dose of 1 cc. was used, and later the dose was increased to 5 cc. Fifty-five were cured of eczema within four weeks, some improved slowly, and eleven continued to have eczema for more than two and a half months. In the latter the treatment was considered as having failed. It is felt that if the injection of BCG is given at an early age the results are better than if it is given later; the results at from 2 to 5 months of age were all good. Doses of from 4 to 5 cc. gave better results than smaller ones. Local treatment of the skin was also employed, and it was found that coal tar ointment was the most efficacious.

BENJAMIN, Montreal.

ACROPATHOLOGIC SYNDROME WITH DISTURBANCES OF PERSONALITY, TREMOR, LOSS OF REFLEXES AND TACHYCARDIA; SLOW REGRESSION; UNDETERMINED ETIOLOGY. P. P. LÉVY and J. SCHNEIDER, Bull. Soc. de pédiat. de Paris **34**:540, 1936.

A girl 10 years old showed trophic and vasomotor disturbances, loss of reflexes, tremor, tachycardia and mental retardation. She had been ill for three years. For a time she was unable to walk but had improved. After considerable differential diagnosis it was considered that her condition resembled acrodynia.

BENJAMIN, Montreal.

CONGENITAL ABSENCE OF SKIN AREAS. P. TRILLAT and P. CORNUT, Nourrisson **25**:117 (March) 1937.

The infant whose condition is described was born at term and developed normally except that its right forearm was undersized owing to the smallness of the bones and muscles. On the extensor surface of this forearm were two areas devoid of skin, one measuring 3 by 2 cm. and the other 3 by 1 cm. At the end of ten days the areas had cicatrized without special treatment.

The Wassermann test on the mother's blood and on blood from the umbilical cord was negative.

MCCLELLAND, Cleveland.

HYPERKERATOSIS SUBUNGUALIS CONGENITA OR PACHYONYCHIA CONGENITA. A. JORDAN and R. RYDNICK, Dermat. Ztschr. **73**:326 (July) 1936.

The authors describe a patient 11 months old who had subungual hyperkeratosis, with thickened nails on all the fingers and toes. The condition had been present at birth. There was no history of similar changes in other members of the family. The baby died of tuberculosis, which it had acquired from its mother, but the authors do not believe that this disease had anything to do with the condition of the nails.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

# Society Transactions

## FOURTH INTERNATIONAL PEDIATRIC CONGRESS

PROFESSOR SPOLVERINI, *President*

*Rome, Italy, Sept. 27 to 30, 1937*

(ABSTRACTED BY R. J. MARTOCCIO, M.D.)

About nine hundred pediatricians from forty nations attended the meeting. The three main subjects discussed were neuropsychic disorders, mineral and water metabolism, and tuberculosis.

### NEUROPSYCHIC DISORDERS IN CHILDREN FROM THE CLINICAL AND THE SOCIAL POINT OF VIEW

The principal speakers were Dr. Jundell (Sweden), Dr. Glanzmann (Switzerland) and Dr. F. H. Allen (United States). Dr. Jundell stressed the importance of prophylaxis for neuropsychic diseases, stating that a mistaken education in the first periods of infancy is a cause of psychopathic states. He expressed the opinion that this problem is not sufficiently appreciated by pediatricians and general practitioners. He maintained that the general practitioner and above all the pediatrician should direct the pedagogic activity of teachers and parents.

Dr. Glanzmann maintained that the object of education is to form a free personality, strong and understanding. He pointed out that in some countries the principle of authority has recently been considered harmful to the development of individuality, a theory which tends to banish compulsion and punishment. The speaker stated the belief that a defective or exaggerated application of the principle of authority can bring about educational errors of pathogenic importance, so far as they can give rise to harmful habits and to morbid manifestations. The speaker stated that it is the task of pediatricians to formulate a doctrine of the character of the personality of the child, founded on somatic and psychic data.

Dr. Allen stated that the psychic personality of the child begins with his recognition of his own existence. The speaker acknowledged two types of therapy for changes in personality and behavior: The first tends directly to influence the parents with advice on bringing up the child; the second, to favor and develop in the child himself the faculty of adaptation and overcoming of inherent difficulties.

In the discussion Dr. Siegl, speaking on the treatment of the child difficult to educate, pointed out that with most nervous manifestations better results are obtained with a suggestive therapy (indifferent medication, faradization, etc.), as long as every appearance of punitive action is avoided.

### MINERAL AND WATER METABOLISM IN EARLY INFANCY AND ITS RELATION TO THE PROBLEM OF ARTIFICIAL FEEDING

The principal speakers were Dr. McQuarrie (Minnesota) and Dr. J. Csapo (Budapest). Dr. McQuarrie reported on the significance of the body fluids and of the various electrolytes in the nutrition of the breast-fed infant. He pointed out that stability of bodily conditions involves the maintenance of a constant temperature and chemical composition of the surrounding watery medium in the cells of the human body. This stability is obtained by well known automatic mechanisms. The water of the body may be considered as belonging to two compartments more or less completely separated by semipermeable membranes: first,

the intracellular compartment, where the fluid is characterized by a preponderance of potassium in comparison to the other fixed bases and a preponderance of phosphate ($PO_4$); second, the extracellular and intercellular compartment, where the fluid is characterized by a preponderance of sodium and chlorides. It has been possible to determine that 30 per cent of the body fluid is extracellular and 70 per cent is intracellular. In normal conditions the interstitial fluid constitutes about four fifths of the extracellular fluid and the plasma only one fifth. The interstitial fluid is the first to feel the marked loss of water due to vomiting, diarrhea and excessive perspiration. If the conditions just cited persist, the blood plasma and then the intracellular water are also affected. For restoration of the water-salt balance dextrose solution is useful, as it prevents ketosis. It is necessary to administer chlorides and fixed bases after vomiting, and lactates of potassium, sodium and calcium after severe diarrhea.

Dr. Csapo stated that with age the child's body becomes richer in intracellular water and in potassium and poorer in extracellular water and in sodium. In the healthy breast-fed infant the proportions of water and of salts change simultaneously, while in the sick child there can be isolated retention of water or of salts.

Dr. Toverud stressed the importance of proper prenatal feeding for mineral metabolism in early infancy.

### THE PROBLEM OF TUBERCULOSIS IN CHILDHOOD

*Modern Studies on the Ultravirus.*—The principal speakers for the first subtopic were Dr. A. Dufourt (France), Dr. Cohen (Belgium) and Dr. Valtis (Greece). Dr. Dufourt spoke on the importance of the ultravirus in acquired and congenital tuberculosis in infants. He stated decisively that the ultravirus cannot be the cause of the three stages of tuberculosis. The speaker, together with Arloing in 1926, was the first to show the passage of the ultravirus through the placenta from the mother to the child. The researches of the last few years have shown that transmission of the virus can give rise to a syndrome of progressive denutrition in the first months of life. Dr. Dufourt stated the belief that the ultravirus does not remain long in the body, that the lymphatic system does not serve as a permanent reservoir for the virus and that the virus is not transformed into tubercle bacilli.

Dr. Cohen stated that there is not at the present time any sure proof that the filtrable elements of the tuberculous virus represent an infravisible and normal phase of the virus, or that they have a pathogenic power different from that of the bacillus from which they arise. Dr. Valtis spoke on the significance of the intradermal reactions to filtrates and to tuberculin. If a patient reacts to the filtrate and not to the tuberculin, this, according to him, is proof of the specific importance of the ultravirus in the etiology of tuberculosis. The final opinion among the discussers was that no definite evidence of such a filtrable virus exists.

*Contagiousness of Tuberculous Infants.*—The principal speaker for the second subtopic was Dr. A. Wallgren (Sweden); Dr. Rietschel (Germany) and Dr. Debré (France) also spoke. Dr. Wallgren stressed the fact that a large percentage of children with a primary tuberculous infection may be a source of contagion to others, because tubercle bacilli have been found in the gastric contents of these children. However, the danger from this source is negligible if the child does not cough. The cases observed are few. Dr. Rietschel stated that in all infants open tuberculosis must be considered as contagious up to the age of 2 years. From tuberculosis of the second stage in older children who are clinically well and who on roentgen examination show tracheobronchial adenopathy, the danger is nil. Dr. Debré expressed the same opinion as the previous speakers. He stated the belief that the child must have a severe cough to be dangerous.

*Prophylaxis and Therapy.*—The principal speakers for the third subtopic were Dr. G. Noeggerath (Germany) and Dr. P. Armand-Delille (France). The discussers were Drs. Kleinschmidt (Germany), Nobel (Austria), Jemma (Italy) and Salvioli (Italy). Drs. Noeggerath and Armand-Delille explained in detail the

organization of the antituberculosis campaign in their respective countries. They pointed out that as a result of this campaign, tuberculosis is diminishing, especially among children.

Dr. Kleinschmidt stated that children recently infected are dangerous sources of contagion for a year. Nobel (Austria) talked on vaccination with BCG and declared himself absolutely against this method, which cannot be considered harmless and is probably ineffectual. Dr. Jemma stressed the importance of antituberculosis prophylaxis in the rural districts. Dr. Salvioli reported on the good results obtained in children treated with the integral anatuberculin of Petragnani (vaccine prepared with bacilli killed with a solution of formaldehyde). In all of them the speaker had been able to demonstrate a tuberculin reaction, and in some, a relative immunity to tuberculosis.

In the discussion Dr. Petragnani pointed out how difficult it is to diminish the ultimate morbidity and mortality of tuberculosis with actual prophylaxis. He maintained that it is safer to use a vaccine of bacilli killed with a solution of formaldehyde, a vaccine which is harmless and gives a lasting and intense allergy.

The general assembly decided that the Fifth International Pediatric Congress will be held in the United States in 1940.

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## CHICAGO PEDIATRIC SOCIETY

C. A. Aldrich, M.D., *President*

*Regular Meeting, Dec. 21, 1937*

George F. Munns, M.D., *Secretary*

Sulfanilamide in the Treatment of Gonorrheal Vulvovaginitis. Dr. Samuel J. Hoffman.

Gonorrheal vulvovaginitis is much more common in children than is generally appreciated. In most of the cases it is due to indirect contact through diapers or other articles in the home or an institution. Children are much more susceptible than are adults. A discharge on the diaper may be the only symptom. With routine use of the vaginoscope, my associates and I have found the cervix involved in practically every case in which the infection is acute. Only those children in whom gonococci were found have been admitted to the hospital and treated by us.

Before sulfanilamide was proposed, the treatment of gonorrheal vulvovaginitis consisted mainly in local application of chemicals and use of biologicals. Our experience with this treatment in a large number of cases at the Cook County Hospital led to unsatisfactory results. There were many recurrences. Even in the large series of cases that we reported in 1930, in which treatment was carried out with immune horse serum, gonotoxin broth filtrates, injected intracutaneously and subcutaneously, ecto-antigen, injected intracutaneously, and live gonococci injected intracutaneously, and by local immunization with gonotoxin or lysed gonococci the results were discouraging. The results of treating 18 patients with estrogenic substance were somewhat better.

In the face of the wave of enthusiasm in favor of sulfanilamide, we used this drug with cautious skepticism in a group of 25 children varying in age from 3 months to 10 years. Three of this group had chronic infection at the time of the institution of treatment, one a subacute infection and the remainder acute infections. No local treatment was used. A standard dosage was used throughout. During the first two days, the daily dosage was ¾ grain (0.048 Gm.) per pound of body weight. During the next five days, the dosage was reduced to three fourths of this amount, or 9/16 grain (0.036 Gm.) per pound. During the second and third weeks, the dosage was reduced to ⅜ grain (0.024 Gm.) per pound. At the end

of a three weeks' course of treatment, a rest period of one week was given regardless of the results of examinations of smears. All patients whose smears showed gonococci at the end of this rest period were given a second course of treatment. After another rest period, a third course of treatment was given to those whose smears showed gonococci. A few patients were given a fourth course of treatment after the third rest period.

Tabulated results showed the following: Only 7 patients were apparently cured during the first course of treatment, or within twenty-one days. By "apparent cure" is meant clinical disappearance of all signs of infection from the urethra, vagina, cervix and rectum and absence of the organism from smears. None of this group was cured within sixteen days.

The 18 patients not yet cured were given a second course of treatment, and 9 of these were cured by the second course, or within, on an average, forty-three days.

Seven of the 9 patients not yet cured were given a third course of treatment. One of this group was cured during the third course, or within sixty-three days.

Four of the 6 remaining patients not yet cured were given another course of treatment after the usual period of rest. One of this group was cured by such additional treatment.

Analysis, therefore, reveals that approximately two thirds of the patients were cured by one or two courses of treatment, after which there was a marked drop in the percentage of those cured by a third or a fourth course of treatment. It seems, then, that a gonococcic infection which does not respond to two standard courses of treatment is relatively resistant to therapy with sulfanilamide.

All patients listed as cured had follow-up examinations from one to three months after their discharge from the hospital. A recurrence in any patient who was clinically and microscopically normal for a period of two weeks after discontinuance of the use of the drug was exceptional.

The incidence of side reactions from the drug was surprisingly small. There was 1 case of urticaria, 2 of slight fever, 4 of epistaxis and 1 of anemia. There were no cases of cyanosis.

Our results with sulfanilamide therapy were much more favorable than those which we had obtained with any other form of treatment.

DISCUSSION

Dr. Maurice L. Blatt: Dr. Hoffman's paper represents ten years of continuous work in an effort to reduce the length of time that girls with gonorrheal infection of the vagina stay in the hospital. It represents thousands of hours of searching inquiry into what constitutes a "cure" of gonorrhea. Many papers have been published on the treatment of gonorrheal infections, many of them favorable to this or that method. The methods have all been evaluated by Dr. Hoffman and his associate, Dr. Snyder. I have watched their efforts with interest, and I believe that their conclusions are extremely valuable. When one considers the large number of girls kept out of school because of vaginal infections and the further effect of prolonged local treatment on their lives, one appreciates the importance of a cure accomplished by oral medication.

Dr. John L. Reichert: Dr. Hoffman has done a great amount of work on this subject over a period of many years. His conclusions are important. In view of the great tendency for juvenile gonorrhea to recur months after apparent cure, I think this report should be considered as preliminary. The results are promising, but they have still to withstand the test of time.

Dr. H. E. Silverman: I believe Dr. Hoffman is to be congratulated for securing such wonderful results in his series of cases. My colleagues and I have encountered a great many cases of gonorrheal vulvovaginitis in one of the large clinics and we have obtained good results from the insertion of the silver picrate suppository—a long narrow suppository about 0.5 cm. in width at its widest portion. Dr. Hoffman has examined the vagina through the vaginoscope. For this

he should be complimented. I say this because so many doctors examine the vagina for evidence of gonococcic infection by mere inspection of the vulva. To examine a child in such a manner is exactly like examining an adult female without making a careful visual inspection of the cervix and vaginal tract. So far as infection of the cervix is concerned, one does not know whether or not the epithelium of the endocervix is also involved. I might say that in some of the cases of ectropion or erosion that one sees the condition is congenital. A child is sometimes born with that anatomic defect. The various methods of treatment which we have tried have included some that Dr. Hoffman mentioned, including use of biologicals. We have had poor results from administration of large doses of estrogenic substances. Some of the good results reported in the literature have been absent in our cases. The growth of epithelium to the adult stage was not as complete as we had expected it would be. We find the insertion of the silver picrate suppository satisfactory and also simple since one of the men in our clinic devised a little metal contrivance into which the suppository is loaded. The injector is placed against the hymenal opening, and by simply pressing on the piston of the little apparatus the suppository is shot upward into the vagina.

Our method of treatment consists in having the mother insert a suppository into the child's vagina each night with the exception of the night before the child comes in for examination. When treatment has been given the night before, smears, if taken, prove unsatisfactory. We have been under the impression that our results were rather striking because we obtained cures in a large number of cases in a very short time. By this I mean a period of one or more months. Dr. Hoffman's series is really dramatic, because he has obtained cures in seventeen days, and any method by which a cure can be attained in so short a time is certainly worthy. One does not know how bad vulvovaginitis can be until one has been in an institution where only one patient suffering from it was present and in a short while has seen all the children in the ward become involved. The spread is so rapid that one wonders whether or not the infection is air borne. As to the patients who come back with discharges after once having been apparently cured —do they really present flareups of the old infection or reinfections? We know that in adults flareups are not as common as we once supposed. We consider that patients who come back with symptoms after having had clinical cures are harboring new infections. We believe that this applies also to children. The textbooks lead one to believe that the gonococci will remain viable in the tissues for long periods, sometimes years. We are in frank disagreement with that.

Dr. Samuel J. Hoffman: I should like to thank Dr. Blatt for his kind remarks. I believe he is as well acquainted with the problem as I am, or better. He has worked with us for ten years.

Dr. Reichert is right as to whether the number of times these patients were examined would be adequate for one to consider the patients cured. We merely report the cases after four months of treatment. In this entire group we found one recurrence. All the cervices seemed to be entirely normal after sulfanilamide therapy. I like the word "dramatic" as used by Dr. Reichert. I note Dr. Silverman used it, too. I remember a child who came in with a profuse bloody discharge. Two days after the institution of sulfanilamide therapy the vaginal tract looked as if it were entirely cured.

With reference to the silver picrate suppository, it seems to me that we have been disappointed in so many drugs, and that the results from the suppository are dependent on contact with all of the vaginal mucosa and that it is difficult to have the suppository touch every part of the vaginal vault. We feel more encouraged with this sulfanilamide treatment than with any other therapy that we have used thus far in a series of nearly 1,600 cases observed in a hospital (not in an outpatient clinic).

Cervical Ribs in Early Life. Dr. David B. Davis and Dr. J. C. King.

This article will appear in full in a later issue of the American Journal of Diseases of Children.

OSTEOCHONDRITIS ISCHIOPUBICA IN CHILDHOOD. DR. FRANKLIN J. CORPER.

It has been demonstrated that deviations from normal bone growth may take place in the first decade or two of life, before epiphysial ossification has taken place. Classic examples of such changes are Perthes disease, Osgood-Schlatter disease and vertebral osteochondrosis, which have been classified under the heading of juvenile epiphysitis or osteochondropathy. The exact cause is not known. Trauma has been suggested, but the history in many cases has failed to reveal any prior injury.

Clinically, true osteochondritis juvenilis does not resemble the inflammatory bony lesions. It shows few of the features present in infectious lesions involving bone tissue, except tuberculosis and syphilis. Endocrine factors may play a part in its production. The outstanding changes as shown by x-ray pictures seem to be decalcification, rarefaction or production of cystic areas of absorption in the part affected, possibly with death of bone. After weeks or months, there is evidence of recalcification, increased density and apparent regeneration of bone.

The symptom complex described by most authors consists of pain on the affected side, radiating toward the hip, into the groin and toward the knee, sometimes of sufficient severity to interfere with locomotion.

Four cases are discussed in which the patients had come under observation during the past six years, all under 10 years of age, and in all of which it has been possible to check the progress frequently.

The pediatrician is usually the first one called on to make a primary diagnosis in the juvenile forms of osteochondropathy. The differential diagnosis concerns chiefly trauma, acute and subacute osteomyelitis, tuberculosis and syphilis. The important factors in determining the diagnosis are: The onset, with rapidly progressive local changes, the relatively mild accompanying symptoms and the characteristic roentgenologic picture.

The prognosis is favorable, requiring only rest of the parts affected. No cases have been reported in which permanent disability followed this form of osteochondritis.

DISCUSSION

DR. M. L. SPIVEK: The picture is a little confusing to me. In looking at these x-ray plates, one is struck with the advanced state of the bone lesion. Considering the usual state of affairs in infections of bone, I think this does not run true to form. The point that I want to make is, granted the acute symptoms, I wonder whether the x-ray plate is not showing a semiacute or subchronic process, brought to light by the clinical syndrome of pain, tenderness, fever and limitation of function.

DR. HENRY E. IRISH: This is an excellent study of an interesting and rare collection of material, and it brings to mind the large number of osteitic conditions that have been seen in infants, in which the course and termination have been benign. That is to say, that the diagnosis was pediatric, the treatment was pediatric, and the results were pediatric. My colleagues and I have carried on an almost continuous warfare of a friendly sort with surgeons to induce them not to institute drainage, and our results have been satisfactory. One should remember that the bones in infants are much more highly vascular than the bones in adults, that transitory showers of bacteria have a tendency to localize particularly in the epiphysis, where vascularity is greatest, and that infants are mildly resistant to many strains of bacteria to which adults are fully resistant. One should remember, too, the distinction between a benign and a fulminant type of osteomyelitis, which may be fatal early after onset. This series of cases seems to illustrate this in the onset, the diagnosis and the treatment, and so teaches a valuable lesson, namely, that one should not forget that benign or low-grade osteomyelitis is seen in many infants and that it will terminate favorably under the proper sustaining care, plus rest and time.

DR. FRANKLIN J. CORPER: Dr. Spivek's point is well taken. These patients probably suffered from destruction of the ischiopubic junction prior to the time

at which I saw them. It is significant that they were walking about within two or three weeks after the acute stage had passed, without any apparent pain or disability, and, as I mentioned in my paper, it is difficult to know whether the conditions observed represent various degrees of the same disease or are different diseases entirely.

So far as the discussion by Dr. Irish is concerned, I wonder if the cases could be instances of subacute osteitis or of osteomyelitis. The roentgenologists say that the pictures are not those of infectious bone disease.

# Book Reviews

**Twenty-Five Years of Health Progress.** By Louis I. Dublin and Alfred J. Lotka. No price given. Pp. 611, with 23 charts and 37 tables. New York: Metropolitan Life Insurance Company, 1937.

This report covers the policy holders of the Metropolitan Life Insurance Company during the quarter century from 1911 to 1935; there were 8,000,000 in 1911 and 17,000,000 in 1935. Of these 56.18 per cent were female and 43.49 per cent were under 20 years of age. Negro policy holders in 1934 numbered 11.4 per cent. The general mortality was 3,200,000 deaths of persons between the ages of 1 year and 74 years, or 9.2 per thousand each year. From this group the mortality statistics of the book are drawn. The chapters are devoted to general mortality from all causes, the trend of longevity, the communicable diseases of childhood, tuberculosis, influenza and pneumonia, cancer, cardiovascular renal diseases, diabetes, puerperal conditions and miscellaneous and external causes of death. The appendix gives the methods of compilation and tables on industrial mortality.

Of particular interest among causes of mortality is tuberculosis, which in 1911 headed the list, resulting in 18.5 per cent of the total deaths. In 1935 it had fallen to fifth place, causing 7.0 per cent of the total deaths. Cancer in 1911 was seventh, with 5.4 per cent of the total deaths, and in 1935 was second, with 11.9 per cent. The 10 leading causes of death in 1935, listed in order of importance, were cardiac disease, cancer, influenza and pneumonia, nephritis, tuberculosis, cerebral hemorrhage, accidents, diseases of the coronary arteries, diabetes and appendicitis.

The chapter on the communicable diseases of childhood is of particular interest to pediatricians. For children from 1 year to 14 years of age the death rate was 144.6 per hundred thousand in the period from 1911 to 1915, and 27.7 per hundred thousand from 1931 to 1935. The 4 principal communicable diseases of childhood accounted for 90,400 deaths, or 2.8 per cent of all deaths. In the twenty-five year period as a whole, diphtheria caused 50.3 per cent of the deaths of children, measles 19.2 per cent, scarlet fever 15.8 per cent and whooping cough 14.7 per cent. Deaths from all these diseases diminished during this period, but their sequence remained the same.

It is impossible to quote more than the bare outline of this study in any review, but statistics for all these diseases are split up according to sex, race, age, etc. The report is well written, and the charts and tables are easily read. Altogether, this work is monumental from the standpoint of public health, and it can be read with profit by any one interested in the progress of health.

**The Baby's First Two Years.** By Richard M. Smith, M.D. Fourth edition. Price, $1.75. Pp. 120, with 20 photographs. Boston: Houghton Mifflin Company, 1937.

This book is divided into three sections: The first deals with the rules for the care and feeding of infants; the second contains suggestions to mothers, and the third has recipes and charts. This is one of the best organized and most helpful books for the mother that I have seen. It is well written, and the illustrations are well chosen. It is a book that the pediatrician may safely recommend to the mother for her guidance.

**Tabla de dosificacion de vitaminas y minerales en la primera infancia.** By Drs. Carlos P. Montagna and Pedro J. Vernocchi. Price not given. Pp. 13, with 7 charts. Buenos Aires, Argentina: Carlos and Antonio P. Carulli, 1937.

As the title implies, this publication gives the amounts of vitamins and minerals to be supplied in the diet of children at various ages, especially during the first and second years. It consists largely of tables and should be of some value to those interested in the subject.

# Directory of Pediatric Societies*

## INTERNATIONAL

### International Association of Preventive Pediatrics

President: Prof. S. Monrad, Dronning Louises Børnehospital, Copenhagen, Denmark.
Secretary: Dr. Daniel Oltramare, 15 Rue Lévrier, Geneva, Switzerland.

### International Congress of Pediatrics

President: Prof. Luigi Spolverini, Policlinico Lungo Tevere Melini 24, Rome, Italy.
Secretary: Professor Vitetti, Rome, Italy.
Place: Boston. Time: Summer and Fall, 1940.
American Committee:
Chairman: Dr. Henry F. Helmholz, Mayo Clinic, Rochester, Minn.
Secretary: Kenneth Blackfan, 300 Longwood Ave., Boston.
Canadian Committee:
Chairman: Dr. H. B. Cushing, 1390 Sherbrooke St., W., Montreal.
Secretary: Dr. H. P. Wright, 1509 Sherbrooke St., W., Montreal.

### International Congress for the Protection of Infancy

Secretary: Prof. G. B. Allaria, Corso Bramante 29, Torino 120, Italy.

## FOREIGN

### British Paediatric Association

President: Dr. J. Wilkie Scott, 40 The Rope Walk, Nottingham, England.
Secretary: Dr. Arthur G. Maitland Jones, 31A Weymouth St., London, W. 1.

### Danish Pediatric Society

President: Dr. E. Lenstrup, Copenhagen, Denmark.
Secretary: Dr. E. Gjørup, Dronning Louises Børnehospital, Copenhagen, Denmark.

### Paediatrický Spolok na Slovensku

President: Dr. A. J. Chura, Lazaretská 6, Bratislava, Czechoslovakia.
Secretary: Dr. S. Limbacher, Dlhá 2, Bratislava, Czechoslovakia.
Place: Pediatric Clinic, University, Bratislava. Time: Six times a year.

### Royal Society of Medicine, Section for the Study of Disease in Children

President: Dr. T. Twistington Higgins, 12 Queen Anne St., London, W. 1.
Secretary: Dr. Harold Edwards, 57 Queen Anne St., London, W. 1.
Place: 1 Wimpole St., London. Time: Fourth Friday of each month, 4:15 p. m.

### Palestine Jewish Medical Association, Section of Physicians of Children's Diseases

President: Prof. S. Rosenbaum, 26 Bialikstr., Tel Aviv, Palestine.
Secretary: Dr. A. Brünn, 9 Maazestre, Tel Aviv, Palestine.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

### Sociedad Cubana de Pediatría

President: Prof. Félix Hurtado Galtés, Carlos III 7, Habana.
Secretary: Dr. Carlos Hernández Miyares, San Lazaro 370, Habana.
Place: Cátedra de Clinica Infantil, Hospital Mercedes, Habana. Time: Third Thursday of every month.

## NATIONAL

### American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman: Dr. Clifford D. Sweet, 2940 Summit St., Oakland, Calif.
Secretary: Dr. Albert D. Kaiser, 16 N. Goodman St., Rochester, N. Y.
Place: San Francisco. Time: June 13-17, 1938.

### American Academy of Pediatrics

President: Dr. Philip Van Ingen, 125 E. 71st St., New York.
Secretary: Dr. C. G. Grulee, 636 Church St., Evanston, Ill.
Place: Del Monte Hotel, Del Monte, Calif. Time: June 9-11, 1938.
Region I. Place: Hotel Seneca, Rochester, N. Y. Time: Nov. 11-12, 1938.
Region II. Place: Skirven Hotel, Oklahoma City. Time: Nov. 16, 1938.
Region III. Place: Statler Hotel, Detroit, Mich., and Ann Arbor, Mich. Time: Oct. 27-29, 1938.

### American Hospital Association, Children's Hospital Section

Chairman: Miss Mabel Binner, Children's Memorial Hospital, Chicago.
Secretary: Winifred Culbertson, Children's Convalescent Hospital, Cincinnati.

### American Pediatric Society

President: Dr. Kenneth D. Blackfan, 300 Longwood Ave., Boston.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid St., St. Louis.
Place: Berkshire Inn, Great Barrington, Mass. Time: May 5-7, 1938.

### Canadian Society for the Study of Diseases of Children

President: Dr. Alton Goldbloom, 1543 Crescent St., Montreal, Quebec.
Secretary-Treasurer: Dr. Pearl Summerfeldt, Hospital for Sick Children, Toronto, Ont.

### Society for Pediatric Research

President: Dr. Samuel Z. Levine, 525 E. 68th St., New York.
Secretary: Dr. A. A. Weech, 3975 Broadway, New York.
Place: The Berkshire Inn, Great Barrington, Mass. Time: Afternoon of May 4 and morning of May 5, 1938.

## SECTIONAL

### North Pacific Pediatric Society

President: Frederick Fischer, 407 Riverside Ave., Spokane, Wash.
Secretary: Dr. C. L. Lyons, Paulsen Medical-Dental Bldg., Spokane, Wash.
Place: Seattle. Time: Last Saturday in January 1938.

### Southern Medical Association, Section of Pediatrics

Chairman: Dr. Charles E. Conrad, 209-210 Professional Bldg., Harrisburg, Va.
Secretary: Dr. Hughes Kennedy Jr., Highland Plaza Apts., Birmingham, Ala.
Place: Oklahoma City. Time: Nov. 15-18, 1938.

## STATE

### Alabama Pediatric Society

President: Dr. J. H. Baumhauer, 56 St. Joseph St., Mobile.
Secretary-Treasurer: Dr. M. Vaun Adams, 803 Government St., Mobile.
Place: Mobile. Time: Third Monday in April 1938.

ARKANSAS STATE PEDIATRIC ASSOCIATION

Chairman: Dr. E. C. McMullen, 500 Main St., Pine Bluff.
Secretary: Dr. Madeline M. Melson, 909 Main St., Little Rock.
Place: Texarkana, Ark. Time: February 1938.

CALIFORNIA STATE MEDICAL SOCIETY, SECTION ON PEDIATRICS

Chairman: Dr. E. Earl Moody, 3780 Wilshire Blvd., Los Angeles.
Secretary: Dr. Hartzel H. Ray, 23–2d Ave., San Mateo.
Place: Pasadena. Time: May 9-12, 1938.

FLORIDA STATE PEDIATRIC SOCIETY

President: Dr. Douglas D. Martin, 442 W. Lafayette St., Tampa.
Secretary: Dr. Warren W. Quillian, 227 Avenue Aragon, Coral Gables.
Place: Concurrent with state association meeting at time of convention.

GEORGIA PEDIATRIC SOCIETY

President: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Secretary-Treasurer: Dr. Don F. Cathcart, 478 Peachtree St., N. E., Atlanta.
Place: Augusta. Time: April 1938.

HEZEKIAH BEARDSLEY PEDIATRIC CLUB OF CONNECTICUT

President: Dr. J. Harold Root, 103 N. Main St., Waterbury.
Secretary: Dr. Joseph L. Hetzel, 103 N. Main St., Waterbury.
Time: Three meetings a year.

INDIANA STATE PEDIATRIC SOCIETY

President: Dr. Ernest R. Carlo, 2902 Fairfield Ave., Fort Wayne.
Secretary-Treasurer: Dr. Mathew Winters, 23 E. Ohio St., Indianapolis.
Time: Two meetings a year.

LOUISIANA STATE PEDIATRIC SOCIETY

President: Dr. Clarence H. Webb, 624 Travis St., Shreveport.
Secretary-Treasurer: Dr. Ruth Aleman, 1407 S. Carrollton Ave., New Orleans.
Place: New Orleans. Time: April 25-27, 1938.

MEDICAL SOCIETY OF STATE OF NEW YORK, SECTION ON PEDIATRICS

Chairman: Dr. John D. Craig, 33 E. 61st St., New York.
Secretary: Dr. Norman L. Hawkins, 11 Public Sq., Watertown, N. Y.
Place: New York. Time: May 9-12, 1938.

MEDICAL SOCIETY OF THE STATE OF PENNSYLVANIA, PEDIATRIC SECTION

Chairman: Dr. John P. Scott, 1740 Bainbridge St., Philadelphia.
Secretary: Dr. John M. Higgins, 600 S. Wilbur Ave., Sayre.

MICHIGAN STATE MEDICAL SOCIETY, PEDIATRIC SECTION

Chairman: Dr. C. R. Dengler, 131 W. Michigan Ave., Jackson.
Secretary: Dr. Ward Chadwick, 524 Medical Arts Bldg., Grand Rapids.

MISSISSIPPI STATE PEDIATRIC SOCIETY

President: Dr. Guy C. Jarratt, 920 Crawford St., Vicksburg.
Secretary-Treasurer: Dr. Harvey F. Garrison Jr., 315 E. Capitol Pl., Jackson.
Place: To be designated by Society. Time: Yearly.

NEBRASKA PEDIATRIC SOCIETY

President: Dr. J. A. Henske, 1614 Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. H. Murphy, 915 Medical Arts Bldg., Omaha.
Place: As announced by committee. Time: Third Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

NORTH CAROLINA PEDIATRIC SOCIETY

President: Dr. John LaBruce Ward, Arcade Bldg., Asheville.
Secretary: Dr. Lewis Elias, 36 Grove St., Asheville.

OKLAHOMA STATE PEDIATRIC SOCIETY

President: Dr. A. L. Salomon, 1200 N. Walker St., Oklahoma City.
Secretary: Dr. Ben H. Nicholson, 301 W. 12th St., Oklahoma City.

SOUTH CAROLINA PEDIATRIC SOCIETY

President: Dr. Leland B. Salters, 317 S. Warley St., Florence.
Secretary-Treasurer: Dr. D. Lesesne Smith Jr., 187 Oakland Ave., Spartanburg.

TENNESSEE STATE PEDIATRIC SOCIETY

President: Dr. Eugene Rosamond, 1074 Madison Ave., Memphis.
Secretary: Dr. Kinsey M. Buck, 1193 Madison Ave., Memphis.
Place: Nashville. Time: April 12-14, 1938.

TEXAS PEDIATRIC SOCIETY

President: Dr. John G. Young, 3930 McKinney Ave., Dallas.
Secretary-Treasurer: Dr. F. H. Lancaster, 4409 Fannin St., Houston.
Place: Galveston. Time: May 10-12, 1938.

VIRGINIA PEDIATRIC SOCIETY

President: Dr. W. Ambrose McGee, 616 W. Grace St., Richmond.
Secretary: Dr. John M. Bishop, Medical Arts Bldg., Roanoke.
Place: Danville, Va. Time: October 1938.

WEST VIRGINIA STATE MEDICAL SOCIETY, SECTION ON PEDIATRICS

President: Dr. Claude L. Holland, 400 Locust Ave., Fairmont.
Secretary: Dr. Theresa O. Snaith, Weston.

## LOCAL

ACADEMY OF MEDICINE OF CLEVELAND, PEDIATRIC SECTION

Chairman: Dr. William M. Champion, 2323 Prospect Ave., Cleveland.
Secretary: Dr. Arthur J. Horesh, 10515 Carnegie Ave., Cleveland.
Place: Cleveland Medical Library Bldg. Time: October, December, February and April.

ACADEMY OF MEDICINE, TORONTO, SECTION OF PEDIATRICS

President: Dr. T. B. Verner, 170 St. George St., Toronto.
Secretary: Dr. D. V. Hutton, 170 St. George St., Toronto.

BRONX PEDIATRIC SOCIETY

President: Dr. Samuel Tripler, 1555 Grand Concourse, New York.
Secretary: Dr. Harry S. Altman, 940 Grand Concourse, New York.
Place: Concourse Plaza Hotel, 161st St. and Grand Concourse. Time: Every second Wednesday of each month, except June, July, August and September.

BROOKLYN ACADEMY OF PEDIATRICS

President: Dr. Walter D. Ludlum, 1421 Cortelyou Rd., Brooklyn.
Secretary: Dr. John A. Monfort, 861 Carroll St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Fourth Wednesday of each month, except May, June, July, August and September.

CENTRAL NEW YORK PEDIATRIC CLUB

President: Dr. Frank Vasder Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Third Thursday of April and September.

### Chicago Pediatric Society

President: Dr. C. A. Aldrich, 723 Elm St., Winnetka, Ill.
Secretary: Dr. George F. Munns, 723 Elm St., Winnetka, Ill.
Place: Children's Memorial Hospital, 710 Fullerton Ave., Chicago. Time: Third Tuesday of each month, October to May, inclusive.

### Dallas Pediatric Society

President: Dr. W. H. Bradford, 1719 Pacific Ave., Dallas, Texas.
Secretary-Treasurer: Dr. John E. Ashby, 3622 Fairmont Ave., Dallas, Texas.
Place: Bradford Baby Hospital. Time: 1 p. m., second and fourth Saturdays of each month.

### Detroit Pediatric Society

President: Dr. W. J. Scott, 5140–2d Ave., Detroit.
Secretary: Dr. Harold E. Clark, 100 Atkinson Ave., Detroit.
Place: Wayne County Medical Society. Time: 8:30 p. m., first Wednesday of each month from October to June, inclusive.

### Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. T. F. Davenport, 104 Ponce de Leon Ave., Atlanta.
Secretary: Dr. James P. Hanner, 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: Second Thursday of each month from October to April, 8 p. m.

### Houston Pediatric Society

President: Dr. Walter F. Qualtrough, 920 Westheimer Ave., Houston, Texas.
Secretary-Treasurer: Dr. Allan Penny Bloxsom, 4402 Travis St., Houston, Texas.
Place: Houston Club. Time: Third Monday of each month.

### Intermountain Pediatric Society

President: Dr. Eugene Smith, 385–24th St., Ogden, Utah.
Secretary-Treasurer: Dr. W. C. Cheney, 1020 Boston Bldg., Salt Lake City, Utah.
Place: Salt Lake City, General Hospital. Time: First Thursday of each month, 8 p. m.

### Kansas City (Missouri) Pediatric Society

President: Dr. W. R. Moore, 620 Francis St., St. Joseph.
Secretary: Dr. F. S. Hogue, 1103 Grand Ave., Kansas City.
Place: Kansas City General Hospital. Time: On call.

### Los Angeles County Medical Association, Pediatric Section

President: Dr. Edwin F. Patton, 3875 Wilshire Blvd., Los Angeles.
Secretary-Treasurer: Dr. Henry F. Gallagher, 1930 Wilshire Blvd., Los Angeles.
Place: Los Angeles County Medical Headquarters, 1925 Wilshire Blvd.
Time: Second Monday of February, April, June, October and December.

### Medical Society of the County of Kings and the Academy of Medicine of Brooklyn, Pediatric Section

President: Dr. Harry R. Litchfield, 163 Eastern Parkway, Brooklyn.
Secretary: Dr. Jacob Rosenblum, 550 Ocean Ave., Brooklyn.
Place: 1313 Bedford Ave., Brooklyn. Time: Third Wednesday of each month, October to May.

### Medical Society of the County of Queens, Inc., Section on Pediatrics

Chairman: Dr. W. C. A. Steffen, 42 Union St., Flushing, N. Y.
Secretary-Treasurer: Dr. Edith A. Mittell, 144–38th Ave., Flushing, N. Y.
Place: Queens County Medical Bldg., Forest Hills, N. Y. Time: Third Monday of October, January, March and May

### Memphis Pediatric Society

President: Dr. Clyde V. Croswell, 1052 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. David W. Goltman, 1073 Madison Ave., Memphis, Tenn.
Place: John Gaston Hospital. Time: Quarterly.

### Milwaukee Pediatric Society

President: Dr. Joseph Shimpa, 2309 N. 36th St., Milwaukee.
Secretary: Dr. Helen Jane Zillmer, 781 N. Jefferson St., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

### New England Pediatric Society

President: Dr. Henry E. Utter, 122 Waterman St., Providence, R. I.
Secretary-Treasurer: Dr. Henry E. Gallup, 1101 Beacon St., Brookline, Mass.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

### New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. Samuel Z. Levine, 525 E. 68th St., New York.
Secretary: Dr.. Philip M. Stimson, 25 Claremont Ave., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

### Northwestern Pediatric Society

President: Dr. Roger L. J. Kennedy, Mayo Clinic, Rochester, Minn.
Secretary-Treasurer: Dr. Robert Rosenthal, 437 Lowry Medical Arts Bldg., St. Paul.
Place: Minneapolis, St. Paul, Duluth and Rochester. Time: January, April, July and October.

### Oklahoma City Pediatric Society

President: Dr. A. L. Salomon, 1200 N. Walker St., Oklahoma City.
Secretary: Dr. G. R. Felts, 1200 N. Walker St., Oklahoma City.
Time: Alternate months.

### Philadelphia Pediatric Society

President: Dr. Julian M. Lyon, 40 Llanfair Rd., Ardmore, Pa.
Secretary: Dr. Aims C. McGuinness, Children's Hospital, 1740 Bainbridge St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each months from October to April, inclusive.

### Pittsburgh Pediatric Society

President: Dr. James LeRoy Foster, Highland Bldg., Pittsburgh.
Secretary-Treasurer: Dr. E. R. McClusky, 3200–5th Ave., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate month from October to June, inclusive.

### Richmond Pediatric Society

President: Dr. A. S. Hurt, 1028 W. Franklin St., Richmond, Va.
Secretary-Treasurer: Dr. Louise Fry Galvin, 2416 Stuart Ave., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: First Thursday of each month (except July, August and September).

### Rochester Pediatric Society

President: Dr. J. Merrel Parker, 11 N. Goodman St., Rochester, N. Y.
Secretary: Dr. H. C. Soule, 16 N. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: Second Friday of each month.

ROCKY MOUNTAIN PEDIATRIC SOCIETY

President: Dr. James E. Russell Jr., 820 Metropolitan Bldg., Denver.
Secretary: Dr. F. Craig Johnson, 1850 Gilpin St., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 2:30 p. m.

ST. LOUIS PEDIATRIC SOCIETY

President: Dr. John Zahorsky, 536 N. Taylor Ave., St. Louis.
Secretary-Treasurer: Dr. Max Deutch, 634 N. Grand Blvd., St. Louis.
Place: St. Louis Medical Society. Time: Third Friday of every month.

SEATTLE PEDIATRIC SOCIETY

President: Dr. Frank H. Douglass, Medical Dental Bldg., Seattle.
Secretary: Dr. C. Luverne Smith, Stimson Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 6:30 p. m.

SOUTHWESTERN PEDIATRIC SOCIETY

President: Dr. Louis M. Earle, 6381 Hollywood Blvd., Los Angeles.
Secretary: Dr. Philip E. Rothman, 3875 Wilshire Blvd., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

UNIVERSITY OF MICHIGAN PEDIATRIC AND INFECTIOUS DISEASE SOCIETY

President: Dr. Damon O. Walthall, 1103 Grand Ave., Kansas City, Mo.
Secretary: Dr. D. Murray Cowie, University of Michigan, Ann Arbor, Mich.

WESTCHESTER COUNTY MEDICAL SOCIETY, PEDIATRIC SECTION (NEW YORK)

President: Dr. R. A. Higgons, 264 King St., Port Chester, N. Y.
Secretary-Treasurer: Dr. Elvira Ostlund, 131 Purchase St., Rye, N. Y.
Place: Grasslands Hospital. Time: Third Thursday in October, December, February and April.